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ARCHEOLOGY.—*Additional data on the Denbigh Flint Complex in northern Alaska.* RALPH S. SOLECKI, Bureau of American Ethnology, and ROBERT J. HACKMAN, U. S. Geological Survey.

Two especially interesting discoveries of artifactual data in the region north of the Arctic Circle in Alaska were made during the summer of 1950. Both are the recovery of specimens typologically similar to the Denbigh Flint Complex (Giddings, 1949 and MS.), an early flint horizon on the north Bering Sea (Fig. 1). One discovery was made on a lake at the foot of the Brooks Range[1] by the junior author. His finds were supplemented by those of George Gryc, who, like the former, is with the U. S. Geological Survey.

This report is a preliminary one, since the significance of the data in its entirety can not be extracted from the evidence at this time. However, this is the second area in the north to produce the unique, finely worked flints and burins in association with a fluted point, all of which may be compared with the "mesolithic" flints J. L. Giddings, Jr. (op. cit.) has recovered at Cape Denbigh. The site discussed in this paper is situated on Lake Natvakruak, 7½ miles north of the mouth of Anaktuvuk Pass, which is one of the best migration pass routes through the Brooks Range Province to the northern slope of Alaska (Solecki, 1950, p. 147). The location of this apparently early occupation close to Anaktuvuk Pass leads us to believe that this mountain breach was probably then in use, just as it is still used by the "Nunamiut"[2] Eskimos today. The latter people are the survivors of the once large group of inland Alaskan Eskimos living north of the Brooks Range. The Nunamiut Eskimos at Anaktuvuk Pass know the lake very well, as their ancestors had reportedly known it before them. Once teeming with edible fish, the lake is now of lessened importance because the numbers of fish have decreased. It is suspected that an ecological change has caused this.

The lake as well as the occupations was definitely postglacial, since they lay in a morainal area.[3] The artifacts were recovered close to the surface, barely at the base of the tundra roots. The small accumulation of soil covering on the site is accounted for by a set of interrelated factors, namely, a very low annual precipitation (5–7 inches), the frigidity of the climate most of the year, a very little erosion, and little deposition of humus because of scant vegetal life.

The field party that the junior author accompanied made camp upon the lake shore between August 4 and 14, 1950. During about three days of this time he found opportunity to check the area for archeological data. Actually two occupational areas were discovered, called here for convenience, sites 1 and 2. These were almost at opposite ends of the nearly mile long oblong-shaped Lake Natvakruak. One site (no. 1) was situated at the northern end, and the other (no. 2) was near the southern end. A narrow tortuous stream outlet drains the lake at the northeast corner to the Sik-Sik-Puk River, thence to the Chandler and Colville Rivers

[1] The other site was located by William Irving, a student at the University of Alaska, and is near Anaktuvuk River in the pass.

[2] The name that these people give themselves according to Robert Rausch, U. S. Public Health Service.

[3] Recent Carbon-14 dating of the glacial recession as of about 12,000 years ago for the Midwest of the United States (Anonymous, 1950, p. 243) presents us with a clue to the greatest possible age of these northern finds. In effect, the archeological guess dates appear to be telescoped or shortened by this atomic age method.

north to the Arctic Ocean. In search for clues to possible old strand lines, it was revealed that there are evidences of former beaches 4 to 6 feet higher than the normal lake level. These beach lines are no guarantee of antiquity, however, since the outlet may be seasonally choked with ice and debris during the spring break-up of the ice which would cause the lake level to rise. Indeed, the lake seems to be contained within the same limits as at the time of the oldest occupation there.

Site 1 lay strung along the top of a small morainal ridge which dammed the lake. Seventeen features were found there, including tent rings of stone and cut caribou antlers, fire hearths, and similar occupational evidence, mostly of recent date. Artifacts of chipped stone were rare, only 40 chert flakes and 3 classifiable stone artifacts having been recovered from this site. These specimens were found in a longitudinal area of about 180 yards long, or one-third of the extent of the site. One of the artifacts, a broad black chert flake, was serrated around the perimeter (Fig. 2, *l*).

The remainder of the stone artifacts were found at site 2. This was a narrow morainal peninsula 400 yards long that jutted into the lake approximately three-fourths of a mile to the south and west of site 1. Stone artifacts were found in two concentrations upon the peninsula. Stone flakes occurred generally broadcast over the area. No stone tent circles were observed on the peninsula proper, although three stone circles were found on the mainland. There were also indications of recent Eskimo occupations on the peninsula and mainland, none of which should be confused with the evidence of earlier habitat.

It was beneath the surface-covering of

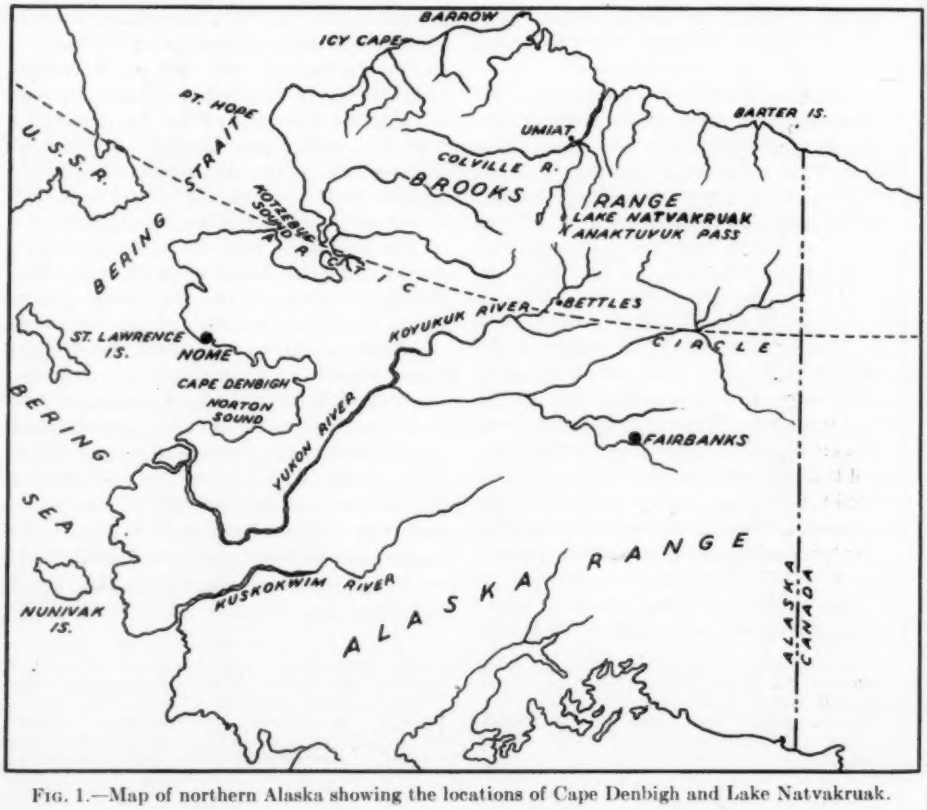

FIG. 1.—Map of northern Alaska showing the locations of Cape Denbigh and Lake Natvakruak.

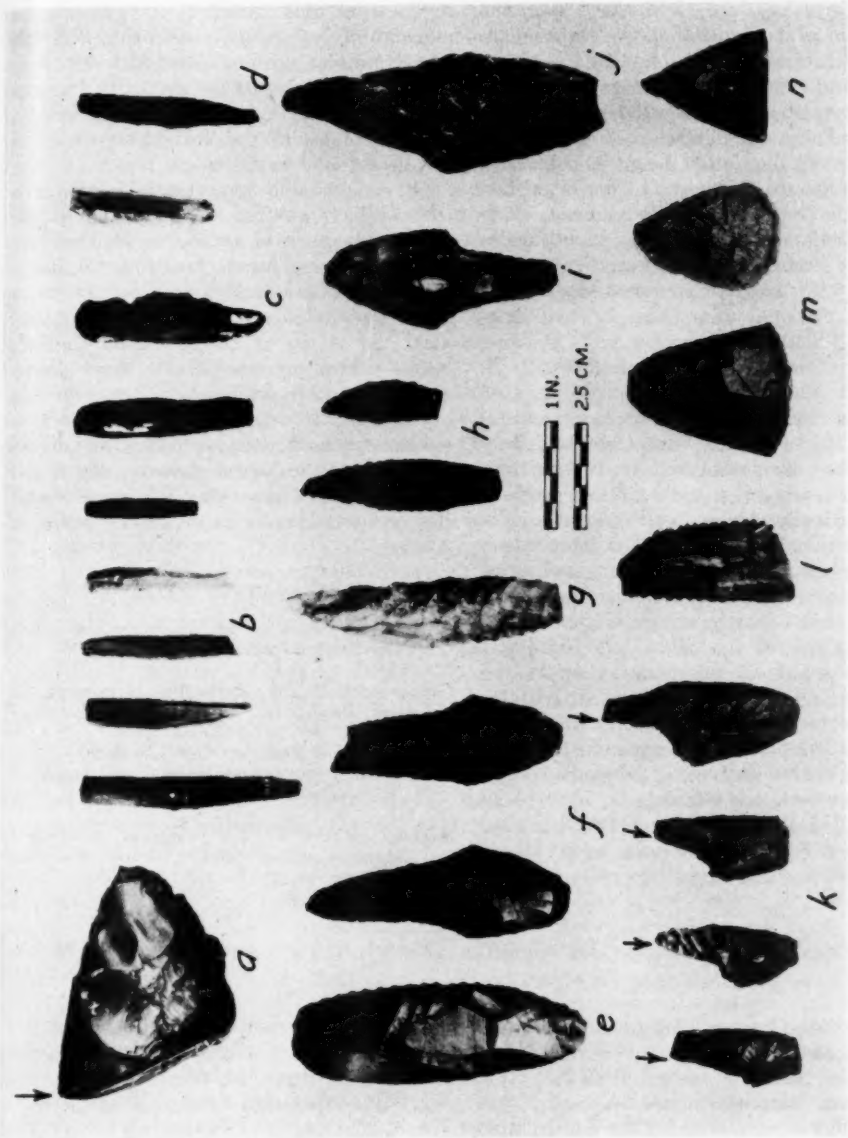

FIG. 2.—Representative archeological specimens found at Lake Natvakruak, which are typologically similar to the Denbigh Flint Complex.

tundra, at a depth of about 5 to 10 inches, that the majority of the specimens resembling the Denbigh Flint Complex artifacts were found. Even though most of the data were recovered closer to the 10-inch depth, this shallowness of deposit contrasts with the approximately 7-foot depth at Cape Denbigh where Giddings (op. cit.) recovered his flints. Assuming that there had been no time lag in occupation, we can only believe that the mechanics of soil formation may have been slower in progression north of the Brooks Range.

Of the 97 artifacts submitted to the senior author for study, 80 are identifiable with Giddings' early flint horizons. All these arti-

facts are of locally derived chert, with the exception of 11 lamellar flakes of obsidian. Among the finds are the following: one semi-polyhedral core from the forward end of which were struck lamellar flakes (Fig. 2, *a*), lamellar flakes represented by (Fig. 2, *b*) and (Fig. 2, *c*), the latter being of obsidian, thin curved spawl detached from a finished flint edge (Fig. 2, *d*), a large convex blade of ovate shape (Fig. 2, *e*), convex end blades (Fig. 2, *f*), finely worked side and end blades (Fig. 2, *g*, *h*), a convex stemmed blade which shows attritional wear (Fig. 2, *i*), a long-stemmed blade with a broken point showing attritional wear on the blade (Fig. 2, *j*). Fig. 2, *k*, illustrates a group of 4 out of 13 artifacts classifiable as burins—a diagnostic trait of the Denbigh Flint Complex. Only one of the burins recovered shows wear from purposeful use as a burin. These artifacts were originally side and end scrapers, showing attritional wear on one or more edged sides. Their preparation for use as burins was therefore a new functional adaptation. Flakes were expertly struck off parallel to the long axis at the distal end, forming a series of steplike niches in one corner. Among the remainder of the illustrated artifacts are a serrated flake (Fig. 2, *l*) which was found at site 1, two end scrapers (Fig. 2, *m*), and the point end of a projectile point, fluted on both surfaces (Fig. 2, *n*). It is to be recalled that Giddings (MS.) has also found a fluted projectile point in his recent excavations at Cape Denbigh associated with artifacts of this complex. At present the associations of Folsom with the Denbigh Flint Complex are not clear. Although Folsom points do occur in Alaska, no actual sites of Folsom occupation like those on the western plains of the United States have yet been found in the north.

Of considerable importance is the fact that we have another stepping stone in the chain of evidence of an ancient trail leading from the Bering Straits area into the heart of North America. This trail is now more literally than figuratively true, since Anaktuvuk Pass is one of the few good through routes connecting the Colville River drainage on the north with the drainages flowing on the south side of the Brooks Range. This evidence, consolidated with other as yet unpublished archeological data on the north slope, bids fair to making this area one of the better archeologically known parts in Alaska.

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ENTOMOLOGY.—Dinoponera gigantea (*Perty*), *a vicious stinging ant.* H. A. ALLARD, Washington, D. C.

From late October 1949 until the second week in March 1950 I was in Tingo Maria and other points in eastern Peru collecting herbarium specimens, insects, and other natural-history material for the Smithsonian Institution at Washington, D. C.

Tingo Maria is a small jungle-town in the rain-forest region on the east slope of the Andes. It is situated in a most beautiful and picturesque little mountain-enclosed tropical valley through which the Huallaga River flows, forming one of the important tributaries of the great Amazon.

During my botanical explorations of the area I spent much time in the dense tropical jungles and deep ravines along the high ridges just east and west of Tingo Maria. Hardly had I arrived there when I made the acquaintance of the huge, black stinging ant *Dinoponera gigantea*. I found it wandering about everywhere on the trails and throughout the jungle generally. It is a handsome, shining black insect an inch or more in length and fears no one. My first actual contact with this vicious ant was a most painful one. Early one afternoon I attempted

to pick one up as a specimen to transfer it to my killing bottle by using several folds of my handkerchief. In spite of this I received a severe thrust of its powerful sting into the end of my index finger. The pain was soon excruciating and lasted until well into the night. So severe was the pain that at times my hand trembled. The next day there were redness and swelling, but no other local symptoms were present. The redness and swelling soon subsided, but a small black spot penetrating deep into the tissues remained at the site of the puncture for a week or more.

Some weeks later I had a far more painful experience with this ant. I had been exploring the jungle away from the trail, trudging through the humus and herbage of the primitive forest, wearing a pair of low canvas tennis shoes of Peruvian manufacture. Somehow I had stepped into or disturbed a colony of these huge ants as I sank into a bed of humus and fallen leafage beside an old decaying log. Two of the ants stung me at the ankle, and in a short time I was in the throes of an agony of burning pain—a pain such as I have never experienced before, nor ever care to repeat as an experience. This was early in the afternoon and at suppertime, 6 p.m., the pain was so intense that I could not keep my foot quiet for any length of time but was forced even to walk about. It had become a most excruciating, throbbing, burning pain and lasted far into the night until sleep intervened. Next morning the pain was nearly gone, but redness, swelling, and tenderness of the ankle persisted for some days. As in the former instance there was no evidence of any local effect on the punctured tissues.

Weeks later while attempting to gather blossoms of a liana on a tree trunk about 6 feet from the ground I placed my right hand on another of these ants and received a sting in the end of my middle finger. As usual the pain was intense and persisted for many hours with redness and swelling, but no local effects developed as in the two previous cases.

Some months later my son's little boy, not much over three years old, accompanied by his father, was paddling in the little brook near the house and playing in the sand on the bank. Suddenly there was a piercing shriek, for he had spied one of these big ants and with a child's curiosity had picked it up, with a resulting severe sting. His suffering was most intense, for he had been stung in the ball of the thumb. There was nothing one could do to quiet him, and he screamed until far into the evening when sleep finally dulled his sensibilities. Next morning there was some redness but no local effects were noticeable. He had, however, learned a most painful lesson, and these ants and other insects were regarded with great suspicion thereafter.

The next victim was my son's cocker spaniel, Rusty. This friendly little animal often accompanied me into the deep jungles. On the day in question we had followed nearly a mile up a steep trail, the little dog trotting along contentedly just ahead of me. Suddenly it gave a jump and assumed a most crestfallen air, rolling around and biting at a hind foot. It had stepped upon one of these stinging ants and at once showed signs of great pain. It no longer had any interest in the trip and suddenly bolted down the trail for home on three legs. I felt responsible for its welfare, so turned back to the house. I found the dog lying on the grass in the backyard and in great pain. It held its hind foot in the air and kicked and bit at it from time to time. The animal was whining and trembling like a leaf and could not remain still. This behavior continued until well into the evening, hours after it had received the sting. Next day some swelling was evident, but no further effects were noticeable.

Neal A. Weber has published accounts of his experiences with the sting of another large ant, *Paraponera clavata* (Fabricius), in Venezuela, first in 1937 in the paper "The Sting of an Ant" (Amer. Journ. Trop. Med. **17** (5). 1937) and later in "The Sting of the Ant, *Paraponera clavata*" (Science, Feb. 10, 1939, pp. 127–128). In the first instance he was stung on the knee, and blisters formed at the site. These local effects persisted for at least a week and the area was red 19–20 days after the sting was received. In my own case there were no local disturbances such as blisters and no systemic effects, as in Weber's experiences. It is probable that different individuals may show marked differ-

ences in their physiological reactions to these stings.

Throughout the tropical rain forests the natives are very familiar with both ants, and are very fearful of their vicious stings. In his book *Ant Hill Odyssey* (1948, p. 91), Dr. William M. Mann says that to the natives in Brazil *Dinoponera grandis* (a synonym of *gigantea*) is known as "tocandero," and they claim that its sting causes a fever.

I was told by natives at Tingo Maria that the sting of *Dinoponera gigantea* has put people in bed and that it can prove fatal. It is much dreaded in this area, as well as elsewhere in those regions where its range extends. According to Weber, in the papers cited, the sting of *Paraponera clavata* is considered to be fatal, and it is designated by the natives as "*viente cuatro hormiga*," or 24-hour ant, because one is thought to die in 24 hours after being stung. As is usual in such instances, the native mind is prone to gross exaggerations, although it is possible that allergic individuals may sometimes suffer very severe reactions, both local and systemic, for this actually occurs in the case of simple wasp and bee stings in our own country.

My son has two small, white-faced native monkeys in a large cage outdoors at Tingo Maria, and these are mortally afraid of the large stinging ants. Often I have seen these ants wandering about on the ground in the cage. The little monkeys take to their perch at once and eye the ants below them with every evidence of profound fear, and well they may.

The workers and larger queens are equipped with a sting. Both *Dinoponera gigantea* and *Paraponera clavata* are ground-inhabiting species, and I have never seen them very far from the ground on tree trunks in the jungle. They are usually seen wandering singly over the trails and jungle floor, and can be met with almost anywhere in such situations. These ants appear to be predacious hunting species, for on several occasions I have seen individuals of *Dinoponera gigantea* roaming about with grasshoppers, spiders, and other arthropods in their mandibles which, presumably, they had captured.

It would be a nice problem for a good organic chemist to study the nature of the venom injected by such ants, as well as that of various bees and wasps. It is known that the venom of different poisonous snakes is far from being of identical composition, and such may be the case with the stinging ants and bees. It may well be something more than a mere quantitative difference concerned with simple formic acid. Perhaps there are qualitative differences as in the case of the complex venoms of different species of snakes.

In my own experience the effects of the sting of *Dinoponera gigantea* have differed somewhat from the stings of bees and wasps in our own country and in the Tropics, and I have been stung by many species of our larger wasps, hornets, and bees and have been bitten by some spiders. Usually there is a more localized puffing up or swelling at the immediate site of the puncture or bite, and this may assume a paler or whiter appearance than the normal skin shows. These ants have never produced such effects in my own experience, but only a generalized redness and swelling, with an intense pain of quite different character. There is one difference in the nature of the puncture of this ant. Its stinging organ is exceedingly long and consequently it appears to be thrust more deeply into the tissues. From the exceptional intensity of the pain one must conclude that a relatively large dosage of venom is present, though the constituents are unknown. Whatever the character of the venom may be, *Dinoponera gigantea*[1] is an ant that brooks no familiarity and is one to avoid, owing to the excruciating pain of its powerful sting.

[1] Students of the species have recognized varietal forms, but I am using the name in a broad sense. I am indebted to M.R. Smith, U.S. Bureau of Entomology and Plant Quarantine, for ant identifications and for suggesting references to Dr. Weber's observations.

ZOOLOGY.—*A revision of the nomenclature of the Gorgoniidae (Coelenterata: Octocorallia), with an illustrated key to the genera.* FREDERICK M. BAYER, U. S. National Musuem.

A superficial inquiry into the nomenclature of the Gorgoniidae was sufficient to reveal a state of confusion in the systematics of that family. Thorough search was therefore begun in order to discover the origin of this confusion and means of its clarification. Apparently, the principal source of error has been the acceptance of incorrect genotypes, without considering the earliest valid designations.

The latest revision of the Gorgoniidae was undertaken by Miss Eva Bielschowsky, a student of the noted zoophytologist Willy Kükenthal. Her preliminary study, prepared as a doctoral dissertation, was published in 1918; considerably expanded, it appeared again in 1929. In these works, Miss Bielschowsky unfortunately overlooked the early type designations of Milne Edwards and Haime and A. E. Verrill. These oversights were in some cases of little consequence, but the correction of two of them will greatly affect modern concepts of gorgoniid nomenclature.

The classification proposed in Miss Bielschowsky's thesis has been accepted without question in late years, and the incorrect name combinations used therein have become familiar. However, I feel that asking for a suspension of the International Rules of Zoological Nomenclature to preserve these combinations resulting from superficial research is not warranted by the limited zoological interest and importance of the gorgoniids.

The two changes necessary are the suppression of *Rhipidigorgia* Valenciennes, 1855, as a synonym of *Gorgonia* Linné, 1758, the genotype of both being *Gorgonia flabellum* Linné; and of *Xiphigorgia* Milne Edwards and Haime, 1857, as a synonym of *Pterogorgia* Ehrenberg, 1834, the genotype of both being *Gorgonia anceps* Pallas.

The disappearance of the name *Rhipidigorgia* could have been prevented had Miss Bielschowsky taken the proper precautions in her revision. Furthermore, the name *Xiphigorgia* could have been synonymized before it had an opportunity to become well established in the modern literature.

To summarize the history of this confusion: Linné's genus *Gorgonia*, 1758, was a heterogeneous collection of nine species: *G. spiralis, ventalina, flabellum, antipathes, ceratophyta, pinnata, aenea, placomus*, and *abies*. Of these, three (*spiralis, aenea*, and *abies*) are antipatharians and do not concern us here; one (*antipathes*) is a plexaurid and one (*placomus*) a muriceid, and were removed from *Gorgonia* by Lamouroux and Ehrenberg respectively. In 1834, Ehrenberg created *Pterogorgia* for eight species including *Gorgonia acerosa* Pallas, *G. fasciolaris* Esper (var. of *citrina*) and *G. anceps* Pallas. In 1850, Milne Edwards and Haime designated *G. anceps* as the type of *Pterogorgia*. In 1855, Valenciennes proposed the genus *Rhipidigorgia* for those species with anastomosing branches, but failed to designate a type species. Then, in 1857, Milne Edwards and Haime established *Xiphigorgia* for one species with trialate and another with whip-like branches, *Gorgonia anceps* Pallas and *G. setacea* Pallas, the first of which they had already selected as the type of *Pterogorgia*. At the same time these authors erected *Leptogorgia* for several species of slender-branched gorgoniids, but, as in *Xiphigorgia*, failed to indicate a type species. Prof. A. E. Verrill in 1868 established without a type species the genus *Litigorgia* for several species of gorgoniids including two with anastomosing branches and five with free branches. In a later paper in the same year, he designated *G. flabellum* Linné as the type of *Gorgonia*, *G. acerosa* Pallas as the type of *Pterogorgia* (overlooking Milne Edwards and Haime's selection of *G. anceps* as the type of that genus), *L. florae* Verrill as the type of *Litigorgia*, and *Gorgonia viminalis* Pallas *sensu* Milne Edwards and Haime as the type of *Leptogorgia*. A status quo obtained until 1918, when Miss Bielschowsky stated in her revision that *G. flabellum* was the type of *Rhipidigorgia*, thereby making it an absolute synonym of *Gorgonia*. Had she realized that Verrill already had used that species as the type of *Gorgonia*, she might have preserved *Rhipidigorgia* by a judicious choice of genotype species.

GORGONIIDAE

Diagnosis.—Holaxonians with branching usually in one plane, lateral or pinnate, alternate or opposite; anastomosis of the twigs present or absent. Zooids usually infrequent or absent at the base of colony, and ordinarily occurring in two lateral rows along stems and branches; low verrucae present or absent. Anthocodial armature usually a weak crown of small, more or less flattened rods or spindles which are either warted or practically smooth. Spicules of the coenenchyma are spindles with regular transverse belts of warts, reaching 0.3 mm in length; spindles

FIG. 1.—*Gorgonia flabellum* Linné. Copied from B. Cerutus, *Musaevn Franc. Calceolari Ivn. Veronensis:* 16, 1622. This is probably the best post-Renaissance illustration of this well-known animal.

with the warts fused to form disks, and peculiar bent spindles (scaphoids) occur in certain genera. Axis horny, with little or no loculation of the cortex.

Remarks.—The genus *Swiftia* Duchassaing and Michelotti, 1860 (monotype *Gorgonia exserta* Ellis and Solander) [=*Stenogorgia* Verrill, 1888 (*S. casta* Verrill) =*Callistephanus* Wright and Studer (*C. koreni* Wright and Studer)] should be transferred to the family Muriceidae.

Genus **Gorgonia** Linné

Gorgonia (part) Linné, 1758, Syst. Nat., ed. 10, **1:** 800. [Type *G. flabellum* L., subs. des. Verrill, 1868, Trans. Connecticut Acad. **1:** 386.]

not *Gorgonia* Bielschowsky, 1918, Revis. Gorg.: 32; Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 852; Kükenthal, 1924, Das Tierreich **47:** 338; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 174.

Rhipidigorgia (part) Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13. [Type, *G. flabellum* L., subs. des. Bielschowsky, 1918, Revis. Gorg.: 49.]

Rhipidogorgia [sic] Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 33; Kükenthal, 1916, Zool. Jahrb., Suppl. 11: 485; Bielschowsky, 1918, Revis. Gorg.: 49; Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 853; Kükenthal, 1924, Das Tierreich **47:** 350; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 192.

Diagnosis.—Colonies with branching in one plane developed as one or more flat fans; twigs closely anastomosed to form a regular network. Zooids in two lateral rows on the twigs, either with very low verrucae or retracting flush with the coenenchyma surface; anthocodial armature of weakly sculptured rods. Coenenchyma spicules as girdled spindles and stout scaphoids.

Genotype.—*Gorgonia flabellum* Linné, 1758 (subsequent designation: A. E. Verrill, 1868, Trans. Connecticut Acad. **1:** 386).

Gorgonia flabellum Linné

Fig. 1

Frutex marinus elegantissimus Clusius, 1605, Exoticorvm: 120 fig.

Planta marina retiformis Olearius, 1674, Gottorf. Kunst-Kamm.: 69, pl. 35, fig. 2.

Planta retiformis maxima + Frutex marinus major Lochner, 1716, Rar. mus. Besl.: 78, 79, pl. 24.

Flabellum Veneris Ellis, 1755, Essay nat. hist. corallines: 61, pl. 26, fig. K.

Gorgonia flabellum Linné, 1758, Syst. Nat., ed. 10, **1:** 801; Esper, 1791, Pflanzenthiere **2:** 23, pls. 2-3a; Verrill, 1869, Amer. Journ. Sci. **48:** 424; Hargitt and Rogers, 1901, Bull. U. S. Fish. Comm. **20** (2): 287, pl. 3, fig. 3.

Rhipidigorgia flabellum Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13.

Rhipidogorgia [sic] *flabellum* Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 33; Kükenthal, 1916, Zool. Jahrb., Supp. 11: 485; Kükenthal, 1924, Das Tierreich **47:** 350, fig. 180; Bielschowsky, 1929, Zool. Jahrb., Supp. 16: 194.

The name by which this species was known for many years is hereby restored. *Gorgonia flabellum* was among the first objects of curiosity brought back from the New World, and published records of it date back well over 300 years. The accompanying illustration of it, perfectly recognizable, was published in 1622.

Valenciennes' genus *Rhipidigorgia* was originally proposed to include all gorgonians with anastomosing branches. The characters used for generic distinction in the time of Valenciennes were necessarily the gross morphological features which could be observed without complex optical devices. The importance of the calcareous spicules had not even been guessed, and as a result it can now be recognized that the original concept of *Rhipidigorgia* included at least three genera as distinguished by modern methods. The three groups of species include (1) *Rhidipigorgia umbraculum* [now in *Gorgonella*]; (2) *R. stenobrochis, arenata* and *cribrum* [usually placed in *Gorgonia*]; and (3) *R. flabellum, coarctata* and *occatoria* [considered to be *Rhidipigorgia* s.s.]. An eighth species, *R. laqueus* Valenciennes (a *nomen nudum*), is still unrecognizable even as to genus, although according to Milne Edwards and Haime (1857) it may be *Gorgonia sasappo* var. *reticulata* Esper (=*Echinogorgia pseudo-sasappo* Kölliker). Verrill in 1864 shifted *R. umbraculum* to the genus *Gorgonella*, and in 1868 made *R. flabellum* (L.) the type of the original Linnaean *Gorgonia*. This procedure left *Rhipidigorgia* with only three species, *R. stenobrochis, arenata* and *cribrum*. When Bielschowsky in 1918, apparently unaware of Verrill's earlier action, considered *R. flabellum* as the type species of *Rhipidigorgia*, she restricted the generic concept to include only those forms with reticulating branches and scaphoid spicules and made it synonymous with the Linnaean *Gorgonia* as restricted by Verrill. Valenciennes' remaining species, *R. stenobrochis, arenata* and *cribrum* have therefore been excluded from all described gorgoniid genera. Although *R. stenobrochis* at various times has been placed in *Leptogorgia, Litigorgia* and *Eugorgia*, those genera as limited by the designation of their type species cannot include these three orphan species and the related forms subsequently described by Verrill and Hickson.

These reticulate gorgoniids lacking scaphoid spicules therefore require a new genus, for which the name *Pacifigorgia* is here proposed.

Pacifigorgia, n. gen.

Rhipidigorgia (part) Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13; Verrill, 1864, Bull. Mus. Comp. Zool. **1:** 32 (part).
Litigorgia (part) + *Eugorgia* (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414.
Leptogorgia (part) Verrill, 1869, Amer. Journ. Sci. **48:** 420.
Gorgonia Bielschowsky, 1918, Revis. Gorg.: 32; Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 852; Kükenthal, 1924, Das Tierreich **47:** 338; Bielschowsky, 1929, Zool. Jahrb. Supp. 16: 141; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 174.

Diagnosis.—Colony flabellate, branched in one plane; the twigs regularly anastomosing to form a close network. Zooids retracting within low verrucae or flush with the surface of the coenenchyma; anthocodial armature of more or less flattened rods usually present. Spicules of the coenenchyma are girdled spindles, including: long, more or less pointed forms with several belts of warts; and short, blunt forms with only 2–4 belts of warts ("double heads").

Genotype.—*Gorgonia stenobrochis* Valenciennes = *Pacifigorgia stenobrochis* (Val.), n. comb., here designated.

Remarks.—This genus includes all those reticulate forms from the west coast of Central and South America previously known as *Gorgonia*. Except for one species from Trinidad and Brazil (*P. elegans* (Duch. & Mich.) = *Gorgonia hortii* Verrill), *Pacifigorgia* is confined to the eastern Pacific, from the Gulf of California to Peru. The generic name is chosen to indicate this predominantly Pacific distribution of the genus.

Pacifigorgia irene, n. sp.
Figs. 2, 3

Leptogorgia adamsii (part) Verrill, 1868, Trans. Connecticut Acad. **1:** 391.
Gorgonia media? Bielschowsky, 1918, Revis. Gorg.: 38; 1929, Zool. Jahrb., Supp. 16: 147.
Gorgonia media Galtsoff, 1950, Special Sci. Rep. U. S. Fish and Wildlife Serv. 28: 27.

Diagnosis.—The colonies form large, broad, finely reticulate fans crossed by several very stout main branches which can be followed to within 2 or 3 cm of the free edge. Zooids occur chiefly along the outer edges of the anastomosed twigs, and are retractile within small, often bilabiate verrucae. Spicules of the coencenhyma are long, pointed spindles 0.1–0.13 mm long, and short, blunt "double heads" up to 0.075 mm long; these sclerites are red, yellow or colorless. Anthocodial armature a weak crown of flat "rods" with broadly scalloped edges, reaching

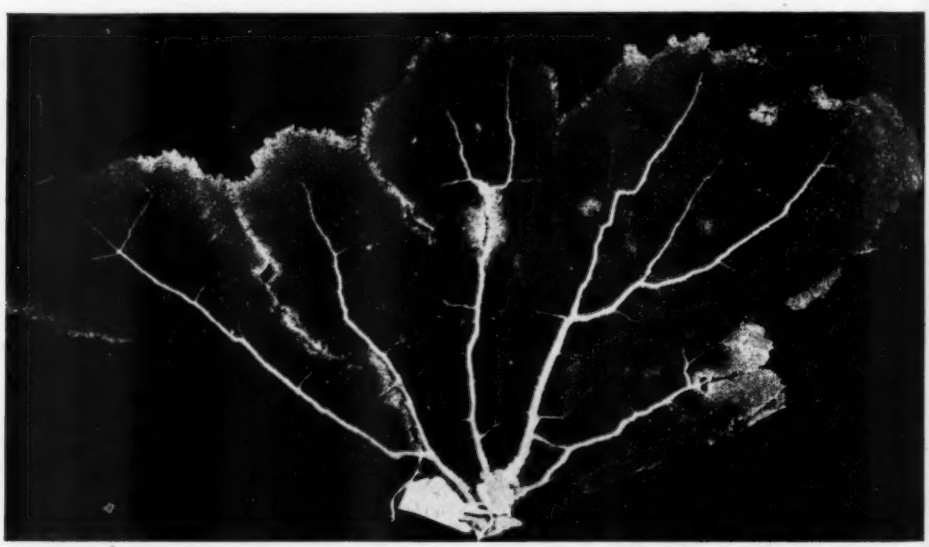


FIG. 2.—*Pacifigorgia irene*, n. gen., n. sp. The holotype, about one-fourth natural size.

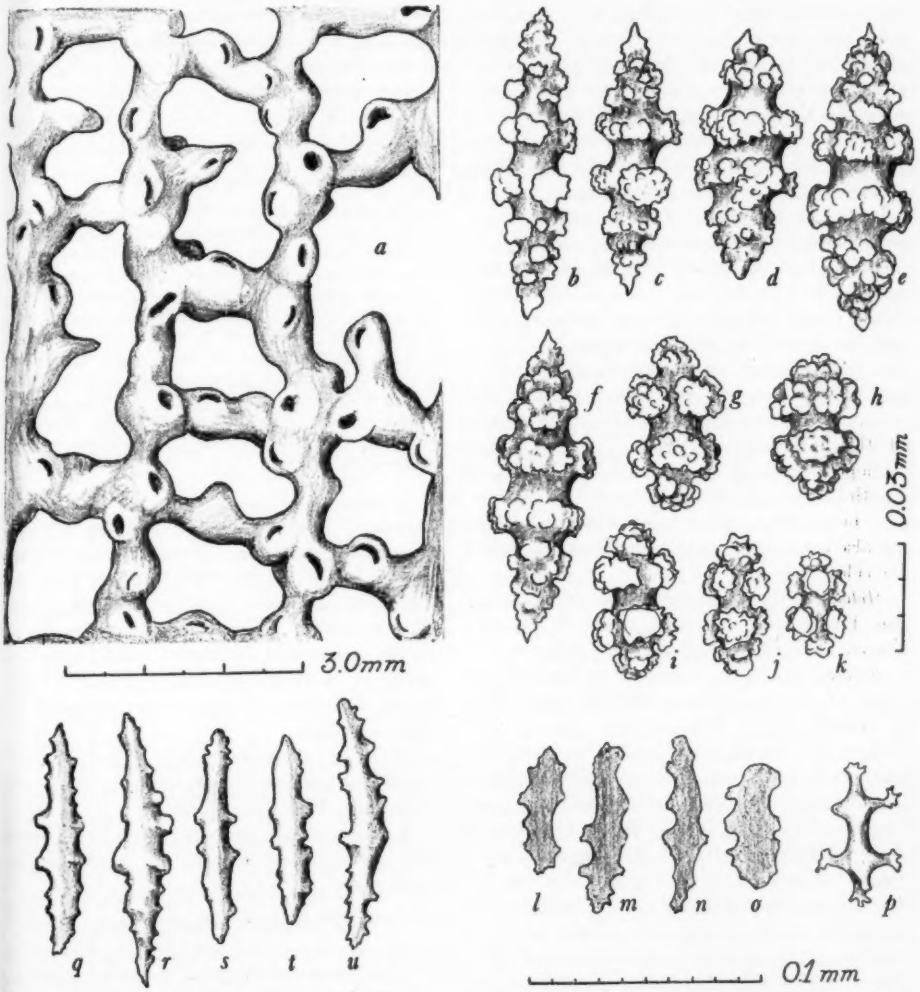


FIG. 3.—*a–p*, *Pacifigorgia irene*, n.gen., n.sp.: *a*, Detail of branching; *b–f*, long spindles; *g–k*, short spindles or "double heads"; *l–o*, flat, anthocodial sclerites; *p*, small capstan from anthocodia. *q–u*, *Pacifigorgia adamsi* (Verrill): Anthocodial sclerites. 3.0-mm scale applies to *a* only; 0.03-mm scale to *p* only; 0.1-mm scale to all others.

0.05 mm in length, and small, spindly capstans about 0.04 mm long; these spicules are usually colorless, but a few may be tinted pink. Color of colony rusty purplish red.

Description.—The type is a broad, flat fan about 35 cm high and 63 cm broad. (A part of the colony has been cut away, and its total width probably exceeded 70 cm.) The twigs are very slender, closely and regularly anastomosed to form a network of small, squarish meshes 1.5–2.0 mm in diameter. Several stout main branches flattened in the plane of ramification arise from the base and radiate outward across the fan, branching occasionally and diminishing in diameter slowly, losing themselves in the meshwork only 2 or 3 cm from the edge of the colony. Zooids do not occur on the flat outer faces of the midribs, but are found in a row along the line where the twigs are given off on either side. The anastomosing twigs are flattened at right

angles to the plane of the fan, and along their outer edges the zooids form small, hemispherical, often bilabiate verrucae; two zooids usually occur on the tips of the free, unanastomosed twig ends, which are up to 5 mm in length. The color of the colony is a rusty purplish red, fading to an ochre yellow in some places along the edge of the fan.

The spicules of the coenenchyma are of two types: (1) long, pointed spindles with a prominent naked girdle and 4–6 belts of warts, reaching 0.13 mm in length; and (2) short, blunt spindles or "double heads" also with a median naked space, but with only two belts of warts and terminal tufts, reaching about 0.075 mm. The coenenchyma spicules are usually red, but a few are colorless. In the yellow areas of the colony they are mostly pale yellow. The spicules of the anthocodia are flat rods with widely scalloped margins, reaching about 0.05 mm in length. These spicules are almost always colorless, but a few may be tinted with pink. There are also a few weak, long-armed capstans, which are colorless.

Holotype.—U.S.N.M. no. 49365. Punta Pajaron, Panama, lat. 7° 55′ N., long. 81° 38′ W.; March 11, 1948, Paul S. Galtsoff, collector.

Records.—Golfo de Nicoya, Costa Rica; March 1927, M. Valerio, collector (49379); Costa Rica no definite locality (33611).

Remarks.—*Pacifigorgia irene* is perfectly distinct from *P. adamsii* (Verrill), with which it was originally included. Verrill's remarks about "adult specimens" (1868, Trans. Connecticut Acad. **1:** 391) refer to this species. The several specimens of *P. adamsii* in the Museum of Comparative Zoology and those in the U. S. National Museum are uniformly small colonies, as are a number of the original specimens in Verrill's collection in the Peabody Museum at Yale University. Unfortunately, the latter have not been available for spicular examination, but all are of such uniform outer appearance that I have no hesitancy in considering them the same. The mesh of P. *adamsii* is about the same as that of the new species, but it lacks any trace of strong midribs, and the color is purple or yellow rather than the rusty purplish red characteristic of *P. irene*. In addition, the anthocodial spicules of the two species are distinct. Those of *P. irene* are flat, broad, and almost always colorless; those of *P. adamsii* are round or but little flattened, slender, longer than those of *P. irene*, and almost always clear, pale yellow. Figures of the anthocodial spicules from both species are given in order to make the differences clear. The coenenchymal spicules differ less, but seem to be a little longer in *P. adamsii*.

The specific name is chosen from the Greek word εἰρήνη, peace, in keeping with the derivation of the generic term *Pacifigorgia*.

Genus **Pterogorgia** Ehrenberg

Gorgonia (part) Pallas, 1766, Elench. Zooph.: 160.
Pterogorgia (part) Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 368. [Type *G. anceps* Pallas, subs. des.: Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx.]
Xiphigorgia (part) Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 171; Kükenthal, 1916, Zool. Jahrb., Suppl. 11: 491 (part); Bielschowsky, 1918, Revis. Gorg.: 62; Kükenthal, 1924, Das Tierreich **47:** 357 (part); Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 200. [Type, *G. anceps* Pallas, subs. des.: Bielschowsky, 1918, Revis. Gorg.: 62.]

Diagnosis.—Colonies more or less richly branched, mostly laterally; branches strongly compressed, triangular, or square; zooids in longitudinal furrows on the edges of rather high, thin coenenchymal ridges running along two, three or four sides of the stems and branches. Zooids small; anthocodial armature a weak crown consisting of 8 tracts of flattened rods. Coenenchyma with stout, strongly warted spindles and blunt scaphoids.

Genotype.—*Gorgonia anceps* Pallas (by subsequent designation: Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx).

Remarks.—This genus includes three certain and one doubtful species, all Antillean. The valid species are:

Pterogorgia anceps (Pallas)

Corallina fruticosa, ramulis & cauliculis compressis, quaquaversum expansis, purpureis elegantissimis Sloane, 1707, Voyage to Jamaica: 57, pl. 22, fig. 4.
Gorgonia anceps Pallas, 1766, Elench. Zooph.: 183; Verrill, 1869, Amer. Journ. Sci. **48:** 425.
Pterogorgia anceps Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 369.
Gorgonia (Pterogorgia) anceps Dana, 1846, U. S. Expl. Exped. **7:** 648.
Xiphigargia anceps Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 172; Kükenthal, 1924, Das Tierreich **47:** 357 (part); Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 201.

This is the common, large, purple or yellowish species with branches square or triangular in cross section. Its branches are never so broad and flat as in *P. guadalupensis* Duchassaing and Michelin.

Pterogorgia citrina (Esper)

Gorgonia citrina Esper, 1792, Pflanzenthiere **2:** 129, pl. 38; Verrill, 1869, Amer. Journ. Sci. **48:** 425.

Pterogorgia fasciolaris + *P. Sancti Thomae* Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 369.

Gorgonia (*Pterogorgia*) *citrina* Dana, 1846, U. S. Expl. Exped. **7:** 648.

Pterogorgia citrina Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 30.

Xiphigorgia citrina Verrill, 1864, Bull. Mus. Comp. Zool. **1:** 33; Kükenthal, 1924, Das Tierreich **47:** 358, fig. 182; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 201.

This is the familiar, small *Pterogorgia* with flat branches, usually yellow with purple edges, sometimes all purple.

Pterogorgia guadalupensis Duchassaing and Michelin

Pterogorgia guadalupensis Duchassaing and Michelin, 1846, Rev. Zool. Soc. Cuvierienne **9:** 218.

Xiphigorgia guadalupensis Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 33.

Gorgonia guadalupensis Verrill, 1869, Amer. Journ. Sci. **48:** p. 425.

Xiphigorgia anceps (part) Kükenthal, 1924, Das Tierreich **47:** 357.

Specimens collected in the Gulf of Mexico during the first and second University of Miami Marine Laboratory Gulf of Mexico Sponge Investigations 1947 and 1948, by Dr. F. G. Walton Smith and J. Q. Tierney, have convinced me that Duchassaing and Michelin's species is perfectly distinct and worthy of recognition. I have been unable to find specimens of *P. anceps* which grade into it, either in the large series in the U. S. National Museum or among specimens in the field. A complete redescription will be published at a later date.

The specimens of *P. guadalupensis* examined agree perfectly with Duchassaing and Michelotti's figure. The species is readily distinguished from *P. anceps* by its very much broader, flat branches which are never trialate. Part of a specimen is shown in the accompanying key-figure 9, compared with *P. anceps*.

A situation similar to that involving *Gorgonia* and *Rhipidigorgia* exists between *Pterogorgia* Ehrenberg and *Xiphigorgia* Milne Edwards and Haime. In short, the genus *Pterogorgia* of Ehrenberg, like many other early genera, was a polyphyletic assemblage, and its species can now be divided into at least two modern genera, apportioned as follows: (1) *P. setosa* Esper, *acerosa* [Pallas?] Ehrenberg, *stricta* Ehrenberg, *turgida* Ehrenberg; and (2) *P. fasciolaris* Ehrenberg (=*citrina* Esper, var.?), *sancti-thomae* Ehrenberg (?=*citrina* Esper), *anceps* Pallas, and *violacea* Ehrenberg non Pallas [?=*anceps*]. Ehrenberg also assigned questionably *Gorgonia americana* Gmelin, *sanguinolenta* Pallas [both *fide* Cuvier], and *pinnata* L. [*fide* Gmelin] to his *Pterogorgia*, without having seen specimens. Milne Edwards and Haime in 1850 designated *P. anceps* (Pallas) as the type species of *Pterogorgia*, thereby restricting the genus to the second group mentioned above. Completely disregarding the restriction which they themselves had imposed, these authors created in 1857 a new genus, *Xiphigorgia*, which included *Gorgonia anceps*, and this usage became generally accepted. This was undoubtedly due in no small part to the fact that the latter arrangement was proposed in their well-known *Histoire naturelle des coralliaires*, whereas the earlier restriction of *Pterogorgia* was made in the introduction to their *Monograph of the British fossil corals*, a work holding little interest to the student of recent Gorgonacea. Consequently, Verrill overlooked the delimitation of *Pterogorgia* and proposed *P. acerosa* (Pallas) as the type species of Ehrenberg's genus; this procedure, which applied the name *Pterogorgia* to the first of the two groups mentioned above, subsequently came into general acceptance. The generic limits of *Xiphigorgia* were established by Miss Bielschowsky when she designated (1918) *X. anceps* as its type, but she failed to perceive that it was then absolutely synonymous with *Pterogorgia* s.s. and that half of the original *Pterogorgia* species were not referable to any described genus. This situation has remained unchanged, and the species eliminated from *Pterogorgia* still require a genus to include them, for which I propose the name *Antillogorgia*.

Antillogorgia, n. gen.

Pterogorgia (part) Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 368; Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 167 (part); Bielschowsky, 1918, Revis. Gorg.: 52; Kükenthal, 1924, Das Tierreich **47:** 351; Bielschowsky, 1929, Zool. Jahrb., Suppl. 16: 197; Deichmann, 1936, Mem. Mus. Comp. Zool, **53:** 193.

Diagnosis.—Colonies mostly bushy, with the secondary branching in one plane; numerous

twigs arranged along the main branches in close pinnate order, sometimes with secondary twigs; stem and branches round or flattened; twigs round, or more frequently somewhat compressed. Zooids small, not producing verrucae, usually arranged in two rows along the edges of the twigs; they sometimes occur in rows on the large branches and main stems. Anthocodia either unarmed or with small, more or less flattened rods arranged in 8 triangles to form a weak crown. Coenenchyma spicules are scaphoids and spindles in the outer layer, spindles alone in the inner.

Genotype.—*Gorgonia acerosa* Pallas = *Antillogorgia acerosa* (Pallas), n. comb., here designated.

Remarks.—This genus is apparently confined to the Antillean region. Its species form one of the most conspicuous elements of the littoral marine fauna along the reefs of Florida and in the West Indies. The most abundant species, at least on the Florida coast, is *Antillogorgia acerosa* (Pallas). For a description, see Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 198. It is usually dark purple when alive. *A. ellisiana* (Milne Edwards and Haime) and *A. americana* (Gmelin) are not uncommon in the same regions. The living colonies are usually brownish purple.

Genus **Phyllogorgia** Milne Edwards and Haime

Gorgonia (part) Esper, 1791, Pflanzenthiere **2:** 1.
Gorgonia (*Pterogorgia*) (part) Dana, 1846, U. S. Expl. Exped. **7:** 647.
Phyllogorgia Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx. [Type, *Gorgonia dilatata* Esper.]
Hymenogorgia Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13. [Type, *Gorgonia quercus folium* Ehrenberg = *Gorgonia dilatata* Esper.]
Phyllogorgia Verrill, 1912, Journ. Acad. Nat. Sci. Philadelphia (2)**15:** 393.

Diagnosis.—Colonies branched in one plane, the branches forming broad, flat leaves; axis anastomosing. Zooids small, without verrucae, on all surfaces of the leaves. The spicules are stout spindles and scaphoids.

Genotype.—*Gorgonia dilatata* Esper (by original designation).

Remarks.—The single species, *P. dilatata*, is found on the coast of Brazil. The single early record of its occurrence at Guadeloupe has not been confirmed.

Genus **Leptogorgia** Milne Edwards and Haime

Gorgonia (part) Pallas, 1766, Elench. Zooph.: 160; Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 157 (part).
Leptogorgia (part) Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 163. [Type, *G. viminalis* Milne Edwards and Haime = *G. viminalis* Esper = *Leptogorgia longiramosa* Kükenthal 1924; subs. des.: Verrill, 1868, Trans. Connecticut Acad. **1:** 387.]
Lophogorgia (part) Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 167. [Type, *G. flammea* Ellis and Solander.]
Litigorgia (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414. [Type, *L. florae* Verrill; subs. des.: Verrill, 1868, Trans. Connecticut Acad. **1:** 387.]
Eugorgia (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414.
?*Pseudopterogorgia* Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 854. [Type, *Leptogorgia australiensis* Ridley, 1884.]
Asperogorgia Stiasny, 1943, Vid. Medd. Dansk naturh. Foren. **107:** 92. [Type, *L. radula* (Möbius).]

Diagnosis.—Colonies mostly branched in one plane, lateral or pinnate, occasionally dichotomous, rarely bushy; branches and twigs somewhat flattened but never greatly expanded to form lamellar ridges. Zooids in two lateral tracts along the sides of twigs and branches, fully retractile or forming low verrucae; anthocodial armature of small rods or spindles usually present. Coenenchyma with girdled spindles but no modified forms.

Genotype.—*Gorgonia viminalis* Milne Edwards and Haime (by subsequent designation: Verrill, 1868, Trans. Connecticut Acad. **1:** 387).

Remarks.—Bielschowsky's designation of *G. petechizans* Pallas as the type of *Leptogorgia* could have no standing even if it had priority, since that species was not included within the genus as originally constituted.

Leptogorgia contains many species in temperate and tropical waters, and although it is represented practically around the world, the center of distribution seems to be in the neighborhood of the west coast of Central America.

The characters ordinarily used for separating *Lophogorgia* from *Leptogorgia*, the flattened branches and arrangement of zooids all around the branches and tiwgs, are so variable as to be useless for generic distinctions. Round as well as flattened branches may occur in the same colony, and the biserial zooid distribution can

be found with little difficulty, Furthermore, specimens of *Leptogorgia* which are typical in all other respects may have zooids distributed all around the twigs. The presence of distinct verrucae, the feature used by Stiasny to distinguish his *Asperogorgia* species from the other Lophogorgias (which he considered as part of *Leptogorgia*), is no more reliable. I have therefore placed both these genera in the synonymy of *Leptogorgia*.

Kükenthal's *Pseudopterogorgia* (1919) was created on the strength of some supposed "klammern" in four Indo-Pacific species. An examination of the original description and figures of the type species, *P. australiensis* (Ridley), suggests that Ridley's original generic assignment of the species (*Leptogorgia*) was correct. The spicules are all described as fusiform, and while one of the individuals figured is a little curved, it is not a very convincing scaphoid. I am therefore tentatively synonymizing the genus and referring its species back to *Leptogorgia*.

Genus **Phycogorgia** Milne Edwards and Haime

Gorgonia Valenciennes, 1846, Voyage of the *Venus*, Atlas of Zool., Zoophytes: pl. 11, fig. 2.
Phycogorgia Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx. [Type, *Gorgonia fucata* Valenciennes.]
Phycogorgia Kükenthal, 1924, Das Tierreich **47:** 359.

Diagnosis.—Colonies bushy, the stems and branches strongly flattened and frondose, arising from a spreading base. Axis lamellar. Zooids small, completely retractile and without armature, on the fronds and on the base. Spicules are small, blunt, girdled spindles.

Genotype.—*Gorgonia fucata* Valenciennes, 1846 (by original designation).

Remarks.—Only one species is known, occurring in shallow water from Mazatlán to Chile.

Genus **Eugorgia** Verrill

Lophogorgia (part) G. Horn, 1860, Proc. Acad. Nat. Sci. Philadelphia **12:** 233.
Gorgonia (part) Verrill, 1864, Bull. Mus. Comp. Zool. **1:** 33.
Eugorgia (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414. [Type, *E. ampla* Verrill; subs. des.: Verrill, 1868, Trans. Connecticut Acad. **1:** 386.]
Eugorgia Verrill, 1868, Trans. Connecticut Acad. 1: 406; Bielschowsky, 1929, Zool. Jahrb., Supp. 16: 170.

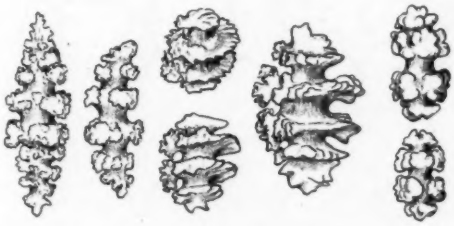
Diagnosis.—Branching chiefly in one plane, lateral or dichotomous, sometimes bushy. Zooids in biserial longitudinal rows, usually without anthocodial armature, with or without low verrucae. The spicules are ordinary spindles, together with disk spindles produced by the more or less complete fusion of the warts of the median 2 or 4 belts to form disks.

Genotype.—*Leptogorgia ampla* Verrill (by subsequent designation: Verrill, 1868, Trans. Connecticut Acad. **1:** 386).

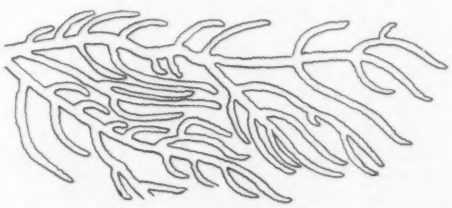
Remarks.—Although *Eugorgia* is now an exclusively west American genus, two Atlantic gorgoniids are apparently related to it. *Leptogorgia virgulata* Lamarck and *L. setacea* (Pallas) have spicules identical with the poorly developed disk spindles and intermediate forms to be found in a number of *Eugorgia* species. They may be relict species of a once widespread *Eugorgia*, or only Leptogorgias developing along *Eugorgia* lines. It remains for future study to determine which is actually the case.

ILLUSTRATED KEY TO THE GENERA OF THE FAMILY GORGONIIDAE

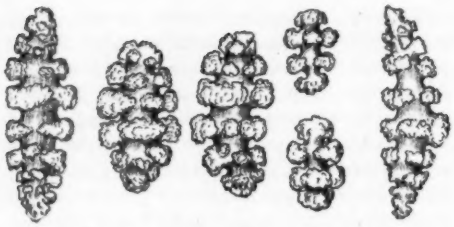
A[1]. Spicules as spindles of various forms, some of which may occasionally be slightly bent, but never as true scaphoids, or "half-moon"-shaped spicules:



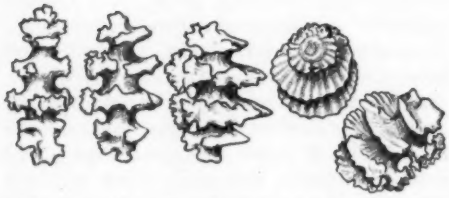
B[1]. Branches and twigs not coalescent, but free and usually slender:



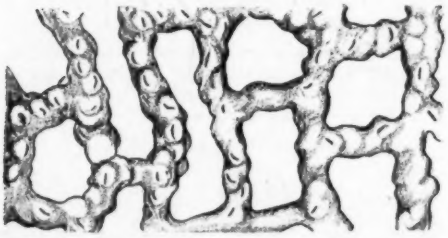
C[1]. Spicules only regular spindles: LEPTOGORGIA.



*C*². Spicules include spindles with warts more or less completely fused to form disks: EUGORGIA.

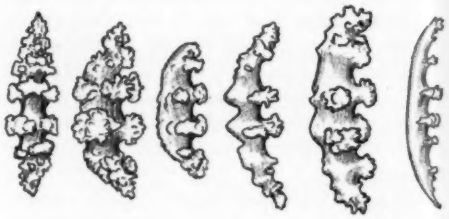


*B*². Branches and twigs coalescing to form a regular meshwork: PACIFIGORGIA.



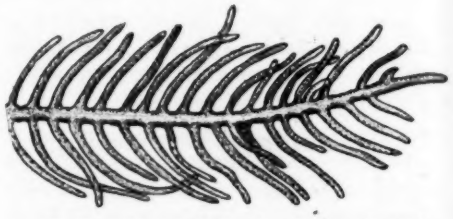
*B*³. Branches and twigs flat, foliate: PHYCOGORGIA.

*A*². Scaphoid spicules present in addition to simple spindles:

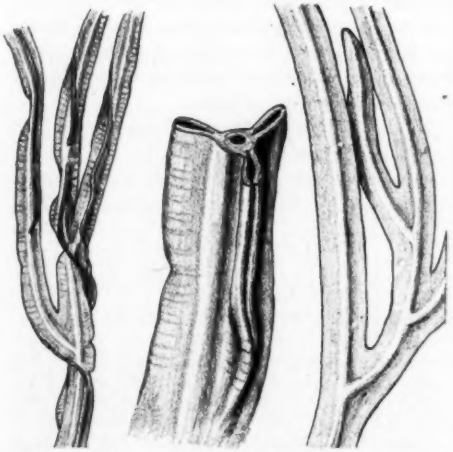


*B*¹. Branches and twigs not coalescent, but free and usually slender:

*C*¹. Branching closely pinnate, the twigs slender, round or only slightly compressed: ANTILLOGORGIA.



*C*². Branching not closely pinnate; branches and twigs with two, three, or four longitudinal, thin, coenenchymal lamellae, causing them to be flat and bladelike, triangular, or square in cross section: PTEROGORGIA.



*B*². Branches and twigs coalescing to form a regular network: GORGONIA.

B^3. Branches and twigs flat, foliate: PHYLLOGORGIA.

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MALACOLOGY.—*Recent species of the veneroid pelecypod* Arctica.[1] DAVID NICOL, U. S. National Museum.

The study represented by this paper is the third in a series on living relict pelecypods. In comparison with *Fimbria* and *Cucullaea*, the living species of *Arctica* is well known, and many good studies have been made on it in several northern Atlantic regions. The shellfish surveys of Rhode Island and Massachusetts have recently obtained valuable information on the ecology of the genus, and it is possible that *Arctica* will soon assume commercial importance as an edible clam. There have, however, been few attempts to make a complete study of the living species. The latest review of *Arctica* is that of Lamy (1920, pp. 260–265).

Arctica, first appearing in the early Cretaceous, has apparently always been confined to temperate waters. Since the Cenozoic the genus has been confined to Europe and the north Atlantic regions. At present there is one living species, confined primarily to the north Atlantic.

Arctica has been placed in many different superfamilies. On the basis of shell characters *Arctica* most closely resembles some of the brackish water genera, as for example *Batissa*. Among the living marine pelecypods *Arctica* resembles the veneraceans. The lack of a pallial sinus and the development of posterior lateral teeth are morphologic characters present in *Arctica* but not in the veneraceans.

[1] Published by permission of the Secretary of the Smithsonian Institution.

Family ARCTICIDAE Newton, 1891

Genus **Arctica** Schumacher, 1817

Venus Linné, 1767 (in part).
Pectunculus da Costa, 1778 (in part).
Cyclas Link, 1807, not *Cyclas* Bruguière, 1798.
Cyprina Lamarck, 1818.
Armida Gistel, 1848, not *Armida* Risso, 1826.
Cypriniadea Rovereto, 1900.

Genotype: *Arctica vulgaris* Schumacher, 1817 = *Venus islandica* Linné, 1767 (monotypy).

In 1752 Moehring used the name *Arctica* for a genus of birds, but this work and the translation published in 1758 have been suppressed (see opinion 5, vol. 1, pt. 14, 1944, pp. 115–126). Schumacher's genus name *Arctica*, published in 1817, can thus be used. Lamarck applied the French vernacular term Cyprine in 1812 but did not use the name *Cyprina* until 1818.

Arctica islandica (Linné), 1767

Figs. 1–3

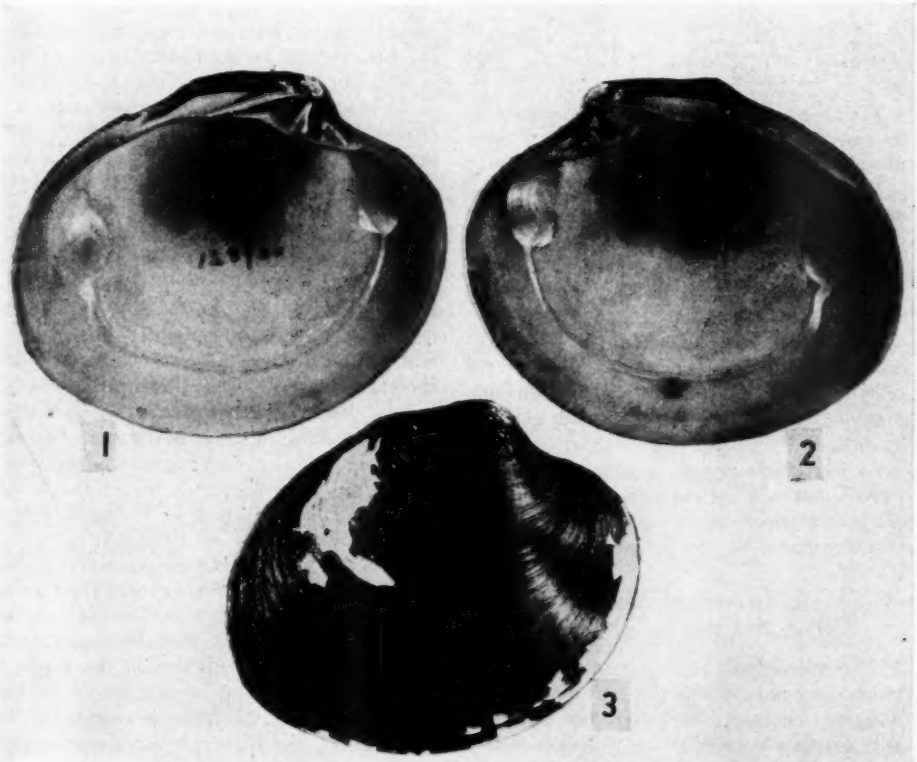
1767. *Venus islandica* Linné, Syst. Nat., ed. 12, **1** (pt. 2): 1131.
1777. *Venus mercenaria* Linné, Pennant, British zoology **4**, Mollusca: 94, pl. 53, fig. 47.
1778. *Pectunculus crassus* da Costa, British conchology: 183, 184, pl. 14, fig. 5.

1778. *Venus buccardium* Born, Rerum naturalium Musei Caesarei Vindobonensis, pt. 1, Testacea: 49, 50.
1780. *Venus bucardium* Born, Rerum naturalium Musei Caesarei Vindobonensis, pt. 1, Testacea: 63, pl. 4, fig. 11.
1798. *Venus islandica* Linné, Röding, Museum Boltenianum: 180, no. 284.
1798. *Venus ferröensis* Röding, Museum Boltenianum: 180, no. 285.
1807. *Cyclas islandica* (Linné), Link, Beschreibung Rostock Sammlung: 150.
1817. *Arctica vulgaris* Schumacher, Essai nouveau système habitations vers testacés: 145, 146, pl. 13, figs. 3a, b.
1818. *Cyprina islandica* (Linné), Lamarck, Animaux sans vertèbres **5:** 557, 558.
1830. *Cyprina vulgaris* (Schumacher), James Sowerby, Genera of Recent and fossil shells, *Cyprina:* pl. 67.
1903. *Cyclas islandica* (Linné), Dall, Tertiary fauna of Florida: 1500–1502.
1910. *Cyprina islandica* var. *inflata* Odhner, Ark. för Zool. **7** (4): 19, figs. 33, 34.
1920. *Cyprina islandica* (Linné), Lamy, Journ. Conchyl. **64** (4): 262–265.

A more complete synonymy is given by Lamy (1920, pp. 262–264) and need not be repeated here.

Description.—Shell porcellaneous, often chalky, periostracum black, light brown, or rarely reddish-brown in color, light brown on small shells, smooth except for raised concentric lines; ornamentation consists of concentric lines of growth; valve outline subcircular, equivalve, subequilateral, not gaping; beaks prosogyrate; ligament opisthodetic, parivincular, external, connected to the periostracum; hinge formula $\frac{\text{AI AIII 3a 1 3b PI}}{\text{AII 2a 2b 4b PII}}$; cyrenoid; pallial line integripalliate, adductor muscle scars subequal; interior ventral border smooth.

Measurements in mm.—



FIGS. 1–3.—*Arctica islandica* (Linné), U.S.N.M. no. 128966a: 1, Interior, left valve; 2, interior, right valve; 3, exterior, right valve. All figures $\frac{2}{3}$ natural size.

U.S.N.M. no.	*Length*	*Height*	*Convexity (both values)*
201566a	106.4	100.5	61.9
34431	99.1	95.5	51.3
201566	97.3	92.2	59.1
102047	96.1	92.0	56.3
34431a	92.9	86.2	42.5
461553	85.4	78.0	47.0
27256a	82.6	76.7	41.4
304728a	81.7	76.5	48.3
201577	80.0	78.0	43.3
128966a	77.5	70.2	37.0
225762	76.9	68.7	39.5
225764a	75.3	67.6	40.1
128966b	74.6	69.5	34.8
461553a	67.8	62.5	34.0
128966c	67.8	62.4	33.7
128966	62.3	56.5	30.6
27258b	61.2	55.8	33.7
225764c	58.8	54.3	30.3
225764b	52.8	46.5	24.8
272258a	45.9	40.0	23.7
499934a	44.4	40.3	22.3
45985	44.3	41.1	22.6
45991	42.1	38.2	22.8
181970a	41.4	36.7	19.8
35686	39.6	36.2	21.4
158995	23.9	21.3	13.3
40146b	21.0	19.4	10.0
40146a	17.8	16.1	9.0
153164a	12.0	10.4	5.9
153164	8.4	8.0	4.5

The above measurements seem to indicate no tendency toward more convex shells in northern waters or cooler bottom temperatures. There may be, however, some relationship between the type of substrate and convexity, the more convex shells being found on the muddier bottoms. More data are necessary to ascertain whether any relationship exists between living conditions and shape of shell.

Number of specimens.—There are approximately 1,000 specimens of *Arctica islandica* in the collection of the United States National Museum. Many of the specimens are small shells obtained by dredging.

Locality data.—Specific localities are so numerous that it is not practical to list each one, and general information on geographical distribution is sufficient for this problem.

GEOGRAPHICAL DISTRIBUTION and ECOLOGY of ARCTICA ISLANDICA (LINNÉ)

This species has been mentioned in most faunal lists of mollusks taken from northern Atlantic localities. Despite these considerably extensive observations, the distribution of living *Arctica islandica* is not well known. There have been several great temperature fluctuations in the northern Atlantic during the Pleistocene and post-Pleistocene, and collectors have taken shells and recorded them in faunal lists, although *Arctica islandica* might not be living in some of those areas today. Accurate locality information on living specimens, furthermore, is the most important criterion for interpreting climatic conditions during Pliocene, Pleistocene, and post-Pleistocene times.

Arctica occurs as far south as Cape Hatteras, N. C., but is quite rare from there northward to Long Island Sound. Along the coasts of Rhode Island, Massachusetts, and Maine, *Arctica* is abundant. It is frequently found in the Bay of Fundy, Halifax Harbor, and Northumberland Strait. There are a few records of *Arctica* in Chaleurs Bay and off the southern coast of Newfoundland. A few valves of *Arctica* have been collected off the coasts of Labrador and Greenland, but these are believed to be subfossil (Jensen, 1912, p. 90). The genus is abundant on the coasts of Iceland, the Faroes, the Shetlands, the British Isles, and the coast of Norway. *Arctica* also occurs off the Kola Peninsula and in the White Sea. There are a few records of shells collected north and east of the White Sea as far as Novaya Zemlya, but these shells are probably also subfossil. There are reports of *Arctica* occurring as far as Bornholm Island in the Baltic Sea, but shells from the Baltic are generally rather thin, and the reduced salinity probably prevents the genus from living farther north and east in the Baltic region. *Arctica islandica* is abundant along the coast of northern France. South of Brittany *Arctica* is rarely reported, but it has been found as far south as the Bay of Cadiz. Occurrences in the Mediterranean are probably all subfossil.

Arctica is a boreal but not an arctic genus. It can not live for probably more than a few hours in waters which go below 0°C. Arcisz et al. (1945, p. 15) recorded *Arctica* living at 0.7°C. Perhaps for this reason the genus is not circumpolar and is not found in the coldest waters of the Atlantic Ocean. On the other hand, the highest temperature which *Arctica* can withstand is about 19°C.

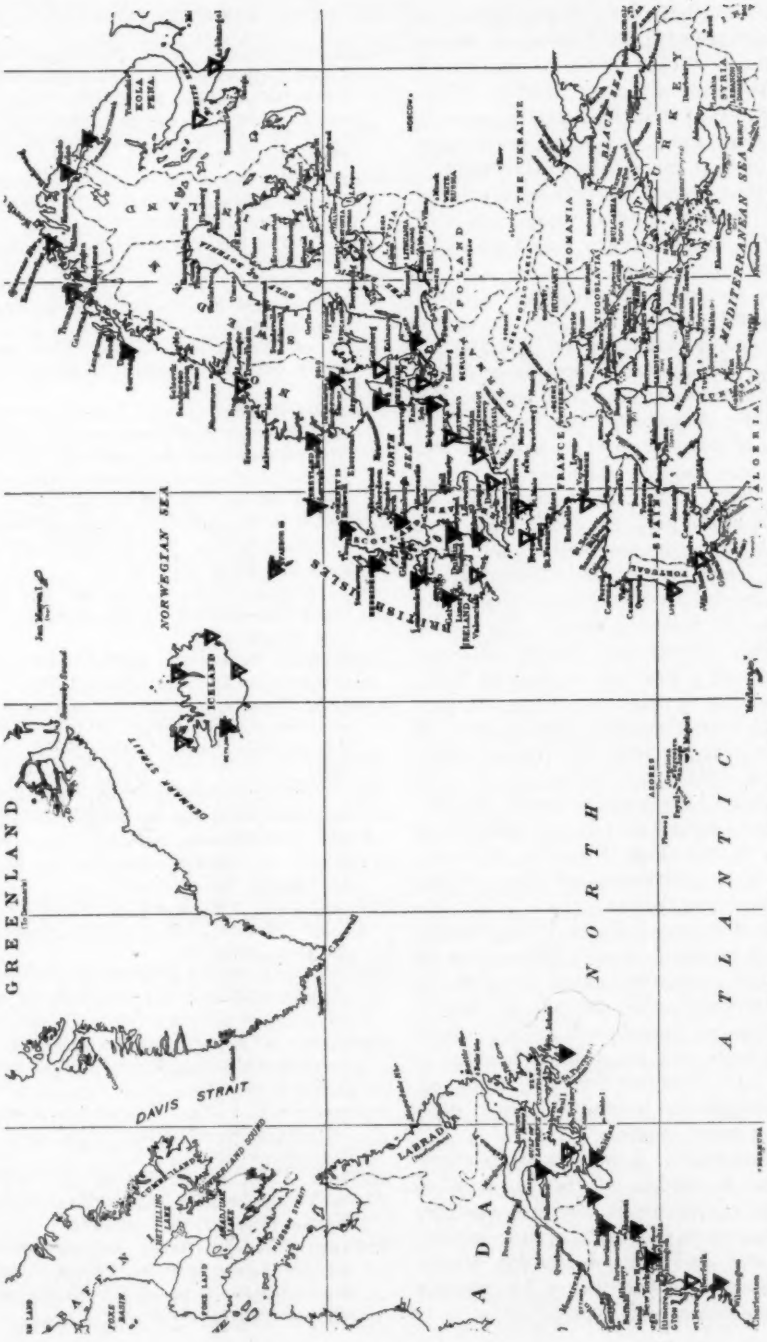


FIG. 4.—Map showing distribution of living specimens of *Arctica islandica* (Linné): ▼, Locality data based on U. S. National Museum specimens; ▽, locality data based on specimens in other museums and on published records.

Recent observations on living specimens by Turner (1949, pp. 15, 16) have shown that *Arctica* is always found on sandy mud or mud bottoms, although Madsen (1949, p. 50) claimed that in Iceland the genus is found on ooze, mud, clay, sand, gravel, and shell bottoms. It can be said with certainty, however, that *Arctica* is nearly always found on sandy mud or mud bottoms, and this statement is based on many observations by many workers.

I have recorded 98 dredging stations, ranging from Halifax to Cape Hatteras, where *Arctica* was taken by the U. S. Bureau of Fisheries. The greatest depth from which *Arctica* was dredged was 482 meters; the next greatest depth was 360 meters. The remaining 96 stations were at depths of 281 meters or less, and one station was only 13 meters in depth. Contrary to some observations made in the past, the small shells were not found at the greater depths, and large and small shells seemed to be found at all recorded depths. In the Firth of Forth the genus has been collected alive at the lowest of low tides (Forbes and Hanley 1853, p. 445). Generally, however, it is most commonly found at depths from 10 to 280 meters, but it is occasionally found as deep as 500 meters. Off the coast of Rhode Island, Arcisz et al. (1945, p. 9) found the greatest concentration of the genus at depths ranging from 25 to 45 meters and did not find living specimens in less than 18 meters of water. In colder water *Arctica* apparently is abundant at shallower depths.

Reports of young shells of *Arctica* having been taken in more than 1,000 meters of water should be reinvestigated. A specimen from the Jeffrey's collection (no. 201564) is labeled *Cyprina islandica* L. (fry), taken from the northwest coast of Ireland at a depth of 1,215 fathoms. This tiny specimen is almost impossible to identify, but it does not appear to be *Arctica*.

Acknowledgments.—I am greatly indebted to William J. Clench, of the Museum of Comparative Zoölogy at Harvard College, for information on geographical distribution, and to Harry J. Turner, Jr., of the Woods Hole Oceanographic Institution, for valuable data on the ecology of *Arctica*.

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ICHTHYOLOGY.—Chromis atripectoralis, *a new damselfish from the tropical Pacific, closely related to* C. caeruleus, *family Pomacentridae.* ARTHUR D. WELANDER and LEONARD P. SCHULTZ.

During our studies of some Bikini fishes at the University of Washington, Seattle, we were surprised to observe that the blue-green damselfish, which occurs so abundantly in shallow waters of the reefs throughout the tropical Indo-Pacific faunal area, was a complex of two species. This paper describes one of these as new and presents data for the separation of the two species.

Chromis atripectoralis, n. sp.

Chromis caeruleus (in part), Jordan and Seale, Bull. U. S. Bur. Fish. **25** (1905): 290, pl. 46, ? fig. 1. 1906 (Samoan Islands; color descriptions for specimens numbered 2, 4, and 6, with pectoral axil black appear to be this new species); Montalban, Pomacentridae of the Philippine Islands, Monog. Bur. Sci. Manila, no. 24: 35, pl. 8, fig. 2. 1927 (Philippine Islands).

Heliastes lepidurus Günther, Fische der Südsee, Journ. Mus. Godeffroy **15** (pt. 7): 238 (in part), pl. 128, fig. C.1881.

Holotype.—U.S.N.M. no. 112397, Bikini Atoll, Eman Island, channel reef, July 17, 1947, S-46-405, Schultz, Brock, Hiatt and Myers, standard length 67 mm.

Paratypes.—The following paratypes are from Guam in the Marianas Islands: U.S.N.M. no. 124104, Tumon Bay, July 10, 1945, R. H. Baker, 48 specimens, 9 to 25 mm; U.S.N.M. no. 152557, Tumon Bay, December 10, 1945, L. Gressitt, 2 specimens, 48 mm; U.S.N.M. no. 152558, Tumon Bay, January 8, 1946, Gressitt and Ingram, 35 specimens, 37 to 60 mm.

The following paratypes are from the Marshall Islands: U.S.N.M. no. 141041, Bikini Atoll, Eman Island, July 17, 1947, S-46-405, Schultz, Brock, Hiatt, and Myers, 5 specimens, 61 to 76 mm; U.S.N.M. no. 112395, Rongerik Atoll, Latoback Island, June 28, 1946, S-46-238, Schultz and Herald, 11 specimens, 23 to 44 mm; U.S.N.M. no. 112396, Rongelap Atoll, Naen Island, July 30, 1946, S-46-302, Herald, 33 specimens, 30 to 70 mm; U.S.N.M. no. 141038, Eniwetok Atoll, Aaraanbiru Island, June 3, 1946, S-46-198, Schultz, 8 specimens, 28 to 67 mm; Chicago Nat. Hist. Mus. no. 44703, Bikini Island, August 14, 1946, S-46-349, Herald, 20 specimens, 22 to 65 mm; C.N.H.M. no. 44704, Rongelap Atoll, Eniaetok Island, July 20, 1946, S-46-267, Herald and Brock, 11 specimens, 31.5 to 61 mm; C.N.H.M. no. 44705, Rongerik Atoll, Latoback Island, August 14, 1946, S-1041, Schultz, Brock, and Donaldson, 2 specimens, 31 to 49 mm.

The following paratypes are from the Philippine Islands, collected by the *Albatross:* U.S.N.M. no. 96435, Langao Point, Luzon, June 24, 1909, 1 specimen, 70 mm; U.S.N.M. no. 152552, Little Santa Cruz Island, May 28, 1908, 2 specimens, 69 to 74 mm; U.S.N.M. no. 152551, Dodepo Island, Celebes, November 19, 1909, 1 specimen, 49 mm; U.S.N.M. no. 96455, Tamahu Island, December 12, 1909, 1 specimen, 71 mm; U.S.N.M. no. 96427, Tara Island, December 14, 1908, 2 specimens, 52 and 64 mm; U.S.N.M. no. 152549, Alimango Bay, Burias Island, March 5, 1909, 1 specimen, 63 mm; U.S.N.M. no. 152550, Makyan Island, November 29, 1909, 1 specimen, 69 mm; U.S.N.M. no. 96460, Port Palapag, June 3, 1909, 2 specimens, 61 mm; U.S.N.M. no. 152553 Bubuan Island, Jolo, February 14, 1908, 2 specimens, 47 and 57 mm; U.S.N.M. no. 152548, Langao Point, Luzon, June 24, 1909, 4 specimens, 47 to 66 mm; U.S.N.M. no. 96423, Port Palapag, June 3, 1909, 1 specimen, 49 mm; U.S.N.M. no. 96410, Pararongpang Island, June 11, 1909, 5 specimens, 47 to 65 mm; U.S.N.M. no. 96473, Mactan Island, Cebu, March 25, 1909, 1 specimen, 82 mm; U.S.N.M. no. 96440, Limbones Cove, February 8, 1909, 1 specimen, 49 mm; U.S.N.M. no. 96434, Candaraman Island, January 4, 1909, 1 specimen, 64 mm; U.S.N.M no. 96477, Biri Channel, June 1, 1909, 1 specimen 59 mm; U.S.N.M. no. 96437, Biri Channel, June 1, 1909, 2 specimens, 59 and 61 mm; U.S.N.M. no. 96432, Philippines, 1 specimen, 50 mm; U.S.N.M. no. 96447, Guntao Island, December 20, 1908, 1 specimen, 52 mm; U.S.N.M. no. 96453, Ligpo Point, Belagam Bay, June 18, 1908, 1 specimen, 31 mm; U.S.N.M. no. 96469, Maculabo Island, June 14, 1909, 1 specimen, 48 mm; U.S.N.M. no. 96452, Sabalayan, Mindoro, December 12, 1908, 1 specimen, 47 mm; U.S.N.M. no. 96468, Port Langcan, Palawan Island, April 8, 1909, 1 specimen, 38 mm; U.S.N.M. no. 152547, Candaraman Island, Balabac, June 4, 1909, 1 specimen, 47 mm.

The following paratypes were collected in var-

ious localities: U.S.N.M. no. 152554, Fiji Islands, 1 specimen, 37 mm.; U.S.N.M. no. 72715, Java, collected by Bryant-Palmer, 1 specimen; U.S.-N.M. no. 65463, Manga Reva, February 4, 1905, *Albatross*, 26 specimens, 38 to 70 mm; U.S.-N.M. no. 152555, Samoan Islands, Jordan and Kellogg, 5 specimens, 43 to 80 mm; U.S.N.M. no. 152556, Samoan Island, Tutuila Island, Pago Pago Bay, June 2, 1939, 11 specimens, 39 to 59 mm.

The following paratypes were collected by the University of Washington group in the Marshall Islands: Eniwetok Atoll, Rigili Island, July 24, 1948, 1 specimen, 47 mm; Eniwetok Atoll, Rigili Island, August 10, 1949, Welander, 1 specimen, 53 mm; Bikini Atoll, Ion Island, August 7, 1947, 1 specimen, 62 mm; Bikini Atoll, Airy Is'and, August 14, 1947, 1 specimen, 57 mm; Bikini Atoll, Amen Island reef, July 31, 1947, 1 specimen, 77 mm; Bikini Island, August 1, 1946, 5 specimens 60 to 77 mm, Bikini Island, July 24 1947, depth 33 feet, 13 specimens, 36 to 83 mm; Likiep Atoll, Likiep Island, August 22, 1949, 11 specimens, 27 to 52 mm; Rongerik Atoll, Latoback Island, August 16, 1947, 1 specimen, 28 mm.

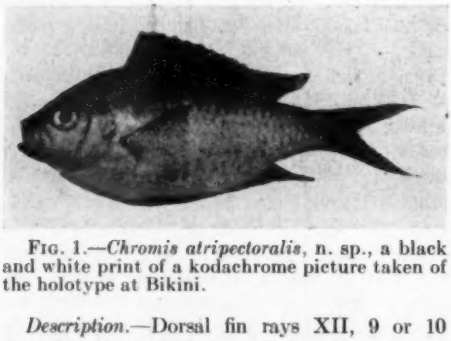

FIG. 1.—*Chromis atripectoralis*, n. sp., a black and white print of a kodachrome picture taken of the holotype at Bikini.

Description.—Dorsal fin rays XII, 9 or 10 (usually 10); anal II, 9 or 10 (usually 10); pectorals ii, 16 to 19 (usually 17 or 18); pelvics I, 5; branched caudal rays 7 + 6; transverse scale rows 24 to 27 from upper edge of gill opening to base of caudal rays; 2 between lateral line and origin of dorsal, 9 between lateral line and origin of anal; dorsal lateral line with 15 or 16 tubular scales; gill rakers on first gill arch, 6 to 9 + 1 + 19 to 22, total 28 to 31.

Depth of body 2.0 to 2.2, length of head 3.1 to 3.6, both in standard length (tip of snout to base of middle caudal rays); snout 3.5 to 4.0, eye 2.8 to 3.3, least preorbital width 7.0 to 8.0, length of upper jaw 2.5 to 2.9, postorbital part of head (hind margin of eye to upper edge of gill opening) 2.2 to 2.5, interorbital width 2.9 to 3.1, least depth of caudal peduncle 2.0 to 2.3, length of pectoral fin 1.2 to 1.3, length of pelvic fin 1.2 to 1.3, length of second dorsal spine 2.0 to 2.3, length of upper caudal rays 0.6 to 1.0, lower 0.7 to 0.9, all in length of head (tip of snout to posterior margin of opercular membrane); depth of caudal peduncle into length of caudal peduncle 1.1 to 1.4; angle of upper profile with lengthwise axis of body 33° to 48°, profile straight to convex.

Teeth of jaws conical, widely spaced, an outer row enlarged teeth, in lower jaw these projecting anteriorly near symphysis, a few teeth at sides near tip of lower jaw curve out posteriorly; inner teeth minute in single row in upper jaws, forming small patches of very minute teeth on either side of symphysis in lower jaw; snout scaled to tip, line from eye, including nostril and along upper edge of preorbital naked; preorbitals and suborbitals scaled, lower margin of latter almost entirely obscured; preopercle produced at angle, its posterior margin entire with some irregular crenulations observable at angle in many specimens; no scales on bases of soft dorsal and anal; upper and lower caudal rays filamentous, 3 free spines on upper and lower caudal base; profile angle, measured with one side of angle lying along closed lower jaw to tip of snout and the other side from snout to nape directly above gill opening, 80° to 96°.

Color in alcohol.—Head and upper half of body bluish gray to brown; lower sides and belly lighter, pale to silvery; a narrow dark to bluish line from eye, just under nostril toward middle of snout along naked area; iris faintly bluish; spiny dorsal membrane more or less dusky, this sometimes accentuated basally and distally, spines dusky; lips, especially at tips of jaws dusky to black; soft dorsal and anal rays dusky, membranes lighter; upper and lower caudal rays brownish, middle rays dusky basally, pale distally; pelvics pale to dusky; pectorals pale except at base where upper rays are dusky to blackish, axil of pectoral with large black blotch, this broadest on dorsal portion and usually not extending to lower rays; in young less than 40 mm in standard length axil of pectoral dusky to black.

Color when alive.—Top of head and back bright bluish green; a narrow blue-green line across upper part of eye to snout and a second line from anterior margin of eye just below nostril to snout; lower half of head, sides of body and belly pure white or grayish white; spiny dorsal smoky pur-

plish; soft dorsal and anal rays dusky, membranes faintly yellowish; upper and lower caudal rays greenish, outer margins blackish, middle rays greenish on scaled portion, yellowish on naked portion, pelvics greyish; pectorals clear hyaline except upper ray dusky.

Remarks.—This new species may be differentiated from *C. caeruleus* on the basis of two striking characters: The black axil of the pectoral fin and by more branched pectoral rays (see table of counts) usually 17 or 18 in *atripectoralis*, whereas *caeruleus* usually has 15 or 16. The pectoral axil of *caeruleus* is pigmented with black dots forming a dusky area only along the dorsal part, thence fading ventrally where no pigment cells occur or only a few, whereas *atripectoralis* has a black axil and the individual black pigment cells are not isolated when viewed under magnification, the outer edge of this black axil sharply contrasts with the pale distal part of the axil. On specimens shorter than about 30 mm. in standard length the axil is not quite as black as in longer specimens. We note that the distal margin of the spiny dorsal fin of *atripectoralis* may have a dusky to blackish line whereas that of *caeruleus* is pale.

Although most of the descriptions in the literature for these blue-green damsel fishes fail to mention the colorations of the pectoral axil, a few do so and show the spiny dorsal fin with a dark margin. We have listed a few such references in the synonymy.

TABLE 1.—COUNTS MADE ON TWO SPECIES OF CHROMIS

Species and locality	Number of fin rays												Number of vertical scale rows crossing lateral line				Number of gill rakers on first arch								
	Dorsal			Anal			Pectoral										Above angle			At angle	Below angle				
	XII	9	10	II	9	10	ii	15	16	17	18	19	24	25	26	27	6	7	8	9	1	19	20	21	22	23	24
C. caeruleus:																											
Marshall Islands	18	3	15	18	—	18	42	8	32	2	—	—	—	3	19	8	—	4	7	1	12	—	—	5	6	1	—
Marianas Islands	—	—	—	—	—	—	22	3	15	4											—						
Philippine Islands	—	—	—	—	—	—	16	2	13	1											—						
Phoenix and Samoan Islands	6	1	5	6	1	5	3	1	2	—	—	—	—	—	—	—	—	—	5	1	6	—	—	2	2	1	1
Total	24	4	20	24	1	23	83	14	62	7	—	—	—	3	19	8	—	4	12	2	18	—	—	7	8	2	1
C. atripectoralis:																											
Marshall Islands	16	1	15	16	1	15	31	—	2	11	21	1	4	10	10	7	1	3	10	1	15	1	4	7	3	—	—
Marianas Islands	—	—	—	—	—	—	21	—	1	4	16										—						
Philippine Islands	—	—	—	—	—	—	16	—	—	8	8										—						
Phoenix and Samoan Islands	4	—	4	4	2	2	5	—	—	—	4	1	—	1	—	1					—						
Total	20	1	19	20	3	17	73	—	3	23	49	2	4	11	10	8	1	3	10	1	15	1	4	7	3	—	—

TABLE 2.—MEASUREMENTS RECORDED FOR TWO SPECIES OF CHROMIS (EXPRESSED IN THOUSANDTHS OF THE STANDARD LENGTH)

Measurements	*C. caeruleus* Bikini Atoll			*C. atripectoralis*				
				Bikini Atoll				Guam Paratype
				Paratype	Paratype	Paratype	Holotype	
Standard length in millimeters	30.2	45.0	58.7	31.1	46.1	52.3	67	41.5
Greatest depth of body	464	449	477	462	475	470	455	458
Length of head	301	298	303	309	293	311	314	313
Length of snout	79	84	83	73	76	79	87	80
Diameter of eye	96	96	85	112	93	101	100	113
Least preorbital width	20	24	29	29	24	36	31	31
Length of upper jaw	99	113	114	116	117	122	112	120
Postorbital part of head	129	120	126	119	121	127	136	137
Interorbital width	86	84	99	103	91	105	90	101
Least depth of caudal peduncle	129	122	131	138	143	137	130	142
Length of pectoral fin	242	249	266	270	269	249	251	265
Length of pelvic fin	268	240	267	251	256	281	230	251
Length of third to sixth dorsal spine	162	140	150	132	154	135	149	147
Length of upper caudal rays	331	—	341	—	360	—	298	362
Length of lower caudal rays	331	—	310	338	321	324	403	386
Length of caudal peduncle	145	160	170	170	182	183	221	222

To the recognized *Chromis caeruleus* (Cuvier and Valenciennes) we refer the following named species: *Heliases caeruleus* Cuvier and Valenciennes, Histoire naturelle des poissons **5:** 497. 1830 (New Guinea; Ulea); *H. frenatus*, ibid.: 498 (Guam); *H. lepisurus*, ibid.: 498 (New Guinea). *Heliases frenatus*, Sauvage, Histoire naturelle des poissons **16:** 436, pt. 28, fig. 1. 1887 (Madagascar); *Chromis lepisurus* Bleeker, Atlas Ichthy. **9:** pl. 403, fig. 7. 1877, and Nat. Verh. Holland. Maatsch. Wet. **2** (6): 164. 1877 (East Indies; Zanzibar; Andamans; Guam; Ulea). *Heliastes lepidurus* Günther, Catalogue of the fishes in the British Museum **4:** p. 63, 1862 (Amboina; emended spelling for *H. lepisurus* Cuvier and Valenciennes); Day, Fishes of India **2:** 389, pl. 82, fig. 1. 1877 (Andamans); Günther, Fische der Südsee, Journ. Mus. Godeffroy **15** (pt. 7): 238 (in part), pl. 128, fig. D (only). 1881. *Glyphiodon anabatoides* Day, Proc. Zool. Soc. London 1870: 696. *Glyphisodon bandanensis* Bleeker, Nat. Tijdschr. Ned. Indie **2:** 248. 1851 (Neira, Banda). *Chromis caeruleus* (in part), Jordan and Seale, Bull. U. S. Bur. Fish. **25** (1905): 290. 1906 (Samoan Islands; in a letter to Dr. Jordan, see p. 291, from Dr. Vaillant who examined the types of *caeruleus*, *frenatus* and *lepisurus*, all three are referred to a single species by him); Aoyagi, H., Biogeographica, Trans. Biogeog. Soc. Japan **4** (1): 186, fig. 14. 1941 (Japan).

Remarks.—Fowler and Bean, U. S. Nat. Mus. Bull. 100, **7:** 31, 61. 1928, have proposed the subgenus *Hoplochromis* for *C. caeruleus*, characterized by having the "front edge of lower jaw with 6 short conic teeth flaring outward."

ICHTHYOLOGY.—*A new genus and species of anacanthobatid skate from the Gulf of Mexico.* HENRY B. BIGELOW and WILLIAM C. SCHROEDER.* (Communicated by L. P. Schultz.)

In 1924 von Bonde and Swart[1] proposed a new genus *Anacanthobatis* for *Leiobatis marmoratus* von Bonde and Swart, a curious batoid from the Natal coast; skatelike in that its pelvic fins are so deeply concave outwardly that they are entirely subdivided with the anterior subdivision limblike, but differing from all typical skates in their perfectly naked skins and in lacking dorsal fins. A second new species, *dubia*, agreeing with *marmoratus* in naked skin and in filamentous prolongation of the snout, but differing from it in that the outer margins of the posterior subdivision of its pelvic fins are fused along their anterior one-half with the inner margins of the pectorals, was also referred to *Anacanthobatis* by von Bonde and Swart.[2] But the unique specimen seems to have lost most of its tail, so that the presence or absence of dorsal fins remains to be learned.

Anacanthobatis is included among the Dasyatidae by Barnard,[3] by Fowler,[4] and by Smith.[5] But the nature of its pelvic fins seems to us to place it among the rajoids, as a separate family, Anacanthobatidae, because of its naked skin and lack of dorsal fins.

No batoid resembling *Anacanthobatis* was seen again until the autumn of 1950, when trawlings by the U. S. Fish and Wild Life Service vessel *Oregon* in the northern side of the Gulf of Mexico, off the Mississippi, yielded two specimens that agree with the South African *A. marmoratus* von Bonde and Swart in structure of pelvics, wholly naked skin, and long slender tail without dorsal fins, but with *A. dubia* von Bonde and Swart in the fact that the outer margins of the posterior subdivision of the pelvic fin is fused along the anterior two-thirds with the inner margin of the pectorals, which is not the case in *marmoratus*. But the Gulf of Mexico form differs from both *marmoratus* and *dubius* in that the end of the snout is expanded in leaflike form (Fig. 1).

The marginal fusion of pelvic fins with pectorals now established for two species is so unusual a character as to justify a new genus, for which we propose the name *Springeria*, in recognition of Stewart Spring-

* Contribution no. 554 from the Woods Hole Oceanographic Institution.

[1] Mar. Biol. Surv. South Africa Rep. 3, spec. Rep. 5 [1922]: 18, pl. 23, and accompanying errata slip. 1924.

[2] Loc. cit., p. 19.

[3] Ann. South African Mus. **21:** 79. 1925.

[4] U. S. Nat. Mus. Bull. 100, **13:** 448. 1941.

[5] *Sea fishes of southern Africa*: 71. 1949.

er's productive studies of the elasmobranchs of Florida and the Gulf. And the curious shape of the snout equally necessitates a new species, which we name *folirostris* for obvious reasons.

Springeria, n. gen.

Genotype.—*Springeria folirostris*, n. sp.

Generic characters.—Snout either prolonged as a simple filament, or expanded terminally in shape shown in Fig. 1, terminating in a soft filament; firm rostral cartilage extending to base of filament; outer margins of posterior lobes of pelvics united along first two-thirds of their length with inner margins of pectorals; inner margins of posterior pelvic lobes attached nearly to tips to sides of tail. Tail without lateral folds, its lower side as well as its upper side with caudal membrane. Pelvic transverse, its anterior

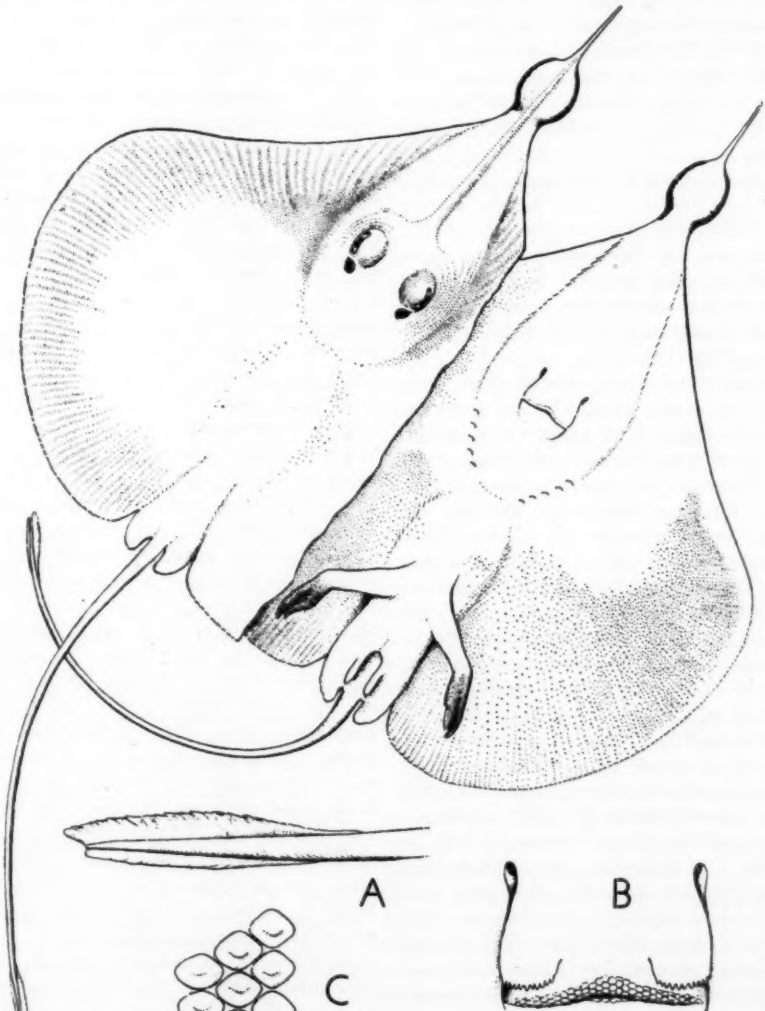

FIG. 1.—*Springeria folirostris*, n.sp., male, 400 mm long, holotype(U. S. N. M. no. 152546): A, End of tail, about ×1.8; B, mouth and nasal curtain, about ×1.8; C, three rows of teeth, upper, about ×10.

profile slightly concave rearward, a long slender process at either end, directed forward, no radial cartilages along anterior half of basipterygial cartilages of pelvic fins.

Species.—Two species known, *S. folirostris*, n. sp., from the Gulf of Mexico, and probably also *dubia* von Bonde and Swart, 1924, South Africa.

Springeria folirostris, n. sp.

Study material.—Immature male, 400 mm long to base of terminal filament; northern Gulf of Mexico off the Mississippi River, lat. 29° 02′ N., long. 88° 34′ W.; 232–258 fathoms; holotype, U. S. N. M. no. 152546; and very young male, 125 mm long, same general locality, lat. 29° 01′ N., long. 88° 30′ W., paratype, Museum of Comparative Zoology.

Distinctive characters.—Springeria folirostris differs from all other known batoids in the peculiar leaflike expansion of the end of its snout. Specimens with this and the tail damaged would still be easily separable from all other rajoids of the Atlantic by their perfectly naked skins; from all dasyatid and myliobatid rays by the nature of their pelvic fins.

Description of type (proportional dimensions in percent of total length).—Disc: Extreme breadth 51.6; length 55.3. Length of snout in front of orbits 21.8; in front of mouth 24.3. Orbits: Horizontal diameter 2.9; distance between 2.6. Spiracles: Length 1.0; distance between 5.1. Mouth: Breadth 4.5. Nostrils: Distance between inner ends 5.8. Gill openings: Lengths, first 0.75, third 0.75, fifth 0.50; distance between inner ends, first 9.2, fifth 4.8. Caudal fin: Length, base, upper 6.0, lower 5.0. Pelvics: Anterior margin 12.7. Distance from tip of snout[6] to center of cloaca 47.6; from center of cloaca to tip of tail 52.4.

Disc from base of terminal filament about 1.1 times as long as broad; maximum anterior angle from level of base of terminal expansion of snout to level of spiracles about 85°; end of snout expanded in leaflike form as shown in Fig. 1, terminating in a slender filament about as long as distance between spiracles. Margins of disc rearward from terminal expansion weakly concave about to level of spiracles, then altering to continuously and strongly convex around to very short inner margins without definite outer or posterior corners. Tail very slender, laterally compressed, increasingly so rearward; its width at axils of pelvic fins (where thickest) about as great as length of eye; its length from center of cloaca to tip about 1.1 times as great as distance from cloaca to base of terminal filament of snout. Skin perfectly naked everywhere, without dermal denticles of any sort. Snout in front of eyes about 8.4 times as long to base of terminal filament as distance between orbits, its length in front of mouth about 6.5 times as great as distance between exposed nostrils. Orbit about 1.1 times as long as distance between orbits, and nearly 3 (2.9) times as long as spiracle which is noticeably small. Nasal curtain conspicuously fringed, each side with 10–11 lobelets; outer margin of nostril only slightly expanded with irregular edge. Exposed nostril noticeably minute. Mouth on immature males a little arched forward, probably also on females, its shape not known for mature males. Teeth $\frac{3}{3}\frac{3}{?}$ on young male, low, with obscure cutting edge but no cusp, and arranged in quincunx. Teeth of mature males not seen. Gill openings minute; first about one-sixth as long as breadth of mouth; fifth about two-thirds as long as first; distance between inner ends of first gills about 1.6 times as long as between exposed nostrils, and between fifth gills about 1.9 times. No dorsal fins. Base of upper caudal fin-membrane about 1.0 times as long as distance between exposed nostrils, of shape illustrated (Fig. 1), its maximum width about one-tenth (about 9 percent) as great as length of its base; lower caudal membrane about half (55 percent) as wide as upper, its origin a little posterior to origin of upper; the two lobes discontinuous at tip of tail. Anterior leglike subdivision of pelvics nearly as long (95 percent) as from pelvic origin to rear corners, broader than thick, fleshy, with one articulation about midway its length, inner edge of the terminal segment scalloped, corresponding to tips of the three radial cartilages. Posterior lobe of pelvics with narrowly rounded rear corner reaching rearward only about as far as rear limits of disc; outer margin joined for about two-thirds its length to margin of pectoral, inner edge joined nearly to tip to side of tail.

Anterior rays of pectorals extending forward to a little posterior to base of terminal expansion of snout; firm rostral cartilage reaching about to base of terminal filament.

[6] Exclusive of rostral filament, which is 23 mm long.

Color: Ash gray above, except unpigmented and translucent in spaces between rostral ridge and anterior rays of pectorals; orbits dusky, terminal expansion of snout narrowly and irregularly margined with black, also the posterior part of the back with a sooty blotch on one side near midline, perhaps the result of injury. Lower surface pale grayish white, the outer posterior belt of pectorals sooty gray, terminal expansion of snout narrowly and irregularly edged with black; tail sooty at base.

Development stages.—Presumably *Springeria* is oviparous like other rajids, but its eggs have not been seen yet.

Size.—How large this skate may grow is not known, for the larger of the two specimens seen so far, 400 mm long to base of terminal filament, is an immature male, its claspers not yet reaching as far as the tips of its pelvics.

Habits.—The two specimens seen so far were trawled at 232–258 fathoms, this with the improbability that this skate would have been overlooked if it occurred in shallow water, suggests that it is confined to depths greater than about 200 fathoms. Nothing else is known of its habits.

Range.—So far known only in the northern side of the Gulf of Mexico off the Mississippi River, at the localities listed on page 112 under Study material.

ORNITHOLOGY.—*Race names in the Central American jay*, Cyanolyca argentigula.

FRANK A. PITELKA, Museum of Vertebrate Zoology, University of California. (Communicated by H. G. Deignan.)

The silver-throated jay, *Cyanolyca argentigula*, is a species of restricted distribution in montane forests of Central America, and at present two rather well marked races are recognized, *C. a. argentigula* (Lawrence) in central Costa Rica and *C. a. blandita* Bangs in northern Panama. When Bangs (Proc. Biol. Soc. Washington **19:** 109. 1906) described the latter from the Volcán de Chiriquí, he evidently did not see Lawrence's type of *argentigula* and assumed from Lawrence's description (Ann. Lyc. Nat. Hist. New York **11:** 88. 1875) that the latter referred to specimens with white throats rather than to those with violet-gray throats. Specimens of the white-throated form, representing *argentigula* as now known, were then and are now more numerous in collections than specimens of the gray-throated form, *blandita*. Reading of Lawrence's description in the light of current knowledge of the two races will reveal that the original description, rather vague as regards critical details, suggests *argentigula* more than it does *blandita*. Ridgway's description (*Birds of North and Middle America*, pt. 3: 319. 1904), based on specimens from both northern Panama and central Costa Rica, applies to and includes both races as now recognized. From these considerations Bangs, in 1906, evidently described *blandita* on the assumption that Lawrence's name applied to the best-known population, that of central Costa Rica. The type of *argentigula*, however, which I examined in Washington, D. C., in December 1949, so closely resembles the type of *blandita*, examined in Cambridge two months earlier, that both evidently represent one and the same race.

Interestingly enough, the basic facts concerning the type of *argentigula* were published in 1889 by Ridgway (Proc. U. S. Nat. Mus. **11:** 541), when he compared it with specimens from the Volcán Irazú and stated: "Compared with the type [four adults] all have the throat-patch decidedly paler, its color being silvery white with a very faint purplish tinge, instead of light silvery grey, with a very strong tinge of purplish blue." Differences in the crown-band are also fully and correctly described by Ridgway. These are the differences used by Bangs to distinguish *blandita*.

There is ample evidence to support that provided by the types themselves. In the specimen register of the United States National Museum, the information on the type of *argentigula*, no. 67963, is as follows: Original number 320, female [inverted Venus's mirror sign on original label indicates female, as collector used usual sign for male], Talamanca, Costa Rica, received from William M. Gabb. In a subsequent entry, C. W. Richmond added the details that the speci-

men was collected by Juan Cooper, in May or June 1874. In Cooper's original catalogue, field numbers 315–320 are listed under the locality heading "En Camo," a phrase of unclear meaning (see beyond). Immediately following 320, however, is the locality heading "Cipurio" [=Sipurio]. Cooper's catalogue carries no dates, but the listing is chronological.

It seems clear that the type was obtained near Sipurio in southeastern Costa Rica, near the Panama border, and on the Caribbean slope of the Cordillera de Talamanca. From present-day knowledge of the altitudinal distribution of *C. argentigula*, we can say that the type was collected well above that lowland town. From a brief account published by Gabb in 1874 (Amer. Journ. Sci. **108:** 388–390), it is known that in the course of a four months' journey into Talamanca, he reached the summit of Pico Blanco, a major peak above and south of Sipurio, on June 13 of that year. In another account, also written in 1874 (see pp. 267–286, Geografía de Costa Rica, by F. Montero Barrantes, Barcelona, 1892), Gabb outlines the route of his ascent between the ríos Urén and Lari, thence across the latter and upward to the summit. The descent was apparently made between the ríos Lari and Deparí, or at least to the northwest of the ascent.

Gabb was accompanied in Talamanca by Juan Cooper, and from Cooper's catalogue and probably other clues, Richmond deduced that the specimens listed under the heading "En Camo" were obtained in May or June 1874. "En Camo" probably means "en camino." The former is the only locality heading used by Cooper other than "Cipurio," which precedes and follows "En Camo."[1]

It thus seems very likely that Lawrence's type was collected near and more or less north of Pico Blanco, above Sipurio and probably in the drainage of the Río Lari. This may be considered the restricted type locality of *Cyanocitta argentigula* Lawrence. The geographic details are given on a map accompanying Carriker's report on Costa Rican birds (Ann. Carnegie Mus. **6:** 314–915. 1910), on which trails leading above Sipurio are indicated.

According to Goodwin (Bull. Amer. Mus. Nat. Hist. **87:** 279. 1945), the major faunal break in the highland faunas of Costa Rica appears to follow the valley of the Río Reventazón, which, with the Río Grande de Tárcoles, separates the Cordillera Central (including Volcán Irazú and Volcán Turrialba) from the Cordillera de Talamanca. Faunal affinities of the latter range are to the south with Panama, at least among mammals (Goodwin, *loc. cit.*).

We now have these facts: The type of *argentigula* shares with *blandita* the pale violet-gray throat and crown-band coloration which Bangs used to distinguish the latter race from the former. Cooper obtained the type of *argentigula* in montane highlands continuous with those inhabited by *blandita* but separated from mountains inhabited by the white-throated race to the north. *Cyanolyca blandita* Bangs is thus a synonym of *Cyanocitta argentigula* Lawrence, and the name formerly applied to the northern race unfortunately must now be applied to the southern race, including, as it has not heretofore, the population of southern Costa Rica. The northern race, left without a name, may be known as—

Cyanolyca argentigula albior, n. name

Type.—Adult male, U. S. N. M. no. 209407, Volcán Turrialba, 9,680 feet, Costa Rica, March 28, 1908, collected by R. Ridgway and J. C. Zeledón, original number 582. Measurements of the type: Wing (chord), 118 mm; tail, 126; bill length (from nostril), 17.6; bill depth (at nostril), 10.1; tarsus, 35.3.

Racial characters.—Compared with *C. a. argentigula* of northern Panama and southern Costa Rica, throat lighter and less purplish (silvery white); transverse band on crown also lighter (silvery white), tinged marginally with pale lavender, but less brightly; supraauricular stripe lighter; wings and tail less purplish (Nigrosin Blue); size probably smaller (see table 1).

Geographic distribution.—Cordillera Central of Costa Rica [Volcán Irazu, Volcán Turrialba, La Hondura, Puente de Tierra, Retes, San Isidro de San José, and San Pedro (de Póas?)].

[1] Gabb was a paleontologist, and I do not know of any evidence clearly indicating that some of the specimens credited to him (for example, by Goodwin, Bull. Amer. Mus. Nat. Hist. **87:** 455. 1945) were collected by him personally.

So far as I can determine now, other than Lawrence's type, none of the specimens of a total of 87 examined by me comes from the mountains of southern Costa Rica, south of the ríos Pirrís and Reventazón. Six specimens bearing the locality "Limon," a Caribbean seaport, were not obtained there but elsewhere and possibly in the province of Limón, which includes the Talamanca district and the Caribbean slopes of the Talamanca Range. But the specimens from "Limon" resemble those from the Cordillera Central and are assigned to *C. a. albior*. Nevertheless, the possibility remains that intergradation of characters occurs at the north end of the Cordillera de Talamanca.

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TABLE 1.—MEASUREMENTS OF ADULTS OF CYANOLYCA ARGENTIGULA

Race	Sex	Number of specimens	Range	Mean with standard error	Standard deviation[1]
C. a. albior:					
Wing	Males	31	112–123	118.2 ± 0.5	3.0
	Females	15	111–120	115.4 ± 0.8	3.0
Tail	Males	30	118–134	124.5 ± 0.8	4.1
	Females	14	116–126	121.4 ± 1.0	3.7
Bill length	Males	31	16.2–18.6	17.42 ± 0.10	0.57
	Females	15	15.8–18.7	16.80 ± 0.25	0.95
Bill depth	Males	31	8.8–10.1	9.31 ± 0.07	0.38
	Females	14	8.3– 8.9	9.14 ± 0.11	0.42
Tarsus	Males	32	32.7–35.7	34.15 ± 0.13	0.76
	Females	15	32.0–34.5	33.24 ± 0.18	0.70
C. a. argentigula:					
Wing	Males	6	119–127	121.8 ± 1.2	2.9
	Females	4	116–125	119.7	3.6
Tail	Males	6	122–141	129.5 ± 2.7	6.5
	Females	4	125–132	128.5	3.5
Bill, length	Males	6	17.1–18.6	17.80 ± 0.26	0.63
	Females	4	16.4–18.1	17.95	0.83
Bill, depth	Males	5	9.6–10.6	9.85 ± 0.17	0.39
	Females	4	9.0–10.2	9.70	0.55
Tarsus	Males	6	33.8–37.3	35.35 ± 0.62	1.52
	Females	4	32.1–35.2	33.95	1.42

[1] In samples of less than 30 specimens, N-1 was used in calculation of standard deviation.

PROCEEDINGS OF THE ACADEMY

443d MEETING OF BOARD OF MANAGERS

The 443d meeting of the Board of Managers, held in the Cosmos Club on January 16, 1951, was called to order at 8:07 P.M. by the President, F. B. SILSBEE. Also present were: N. R. SMITH, H. S. RAPPLEYE, J. A. STEVENSON, H. A. REHDER, A. T. MCPHERSON, W. R. WEDEL, J. S. WILLIAMS, F. O. COE, F. A. WEISS, W. A. DAYTON, C. A. BETTS, R. S. DILL, E. W. PRICE, MARGARET PITTMAN, H. W. HEMPLE, F. M. SETZLER, and, by invitation, R. G. BATES, T. D. STEWART, M. A. MASON, WALTER RAMBERG, and B. D. VAN EVERA.

The Committee on Membership submitted the names of four individuals proposed for resident membership. Seventeen persons previously proposed were elected, 14 to resident and 3 to nonresident membership.

The President announced that all arrangements had been completed for the Annual Meeting to be held at the Kennedy-Warren on January 18, 1951, at which time Dr. PER K. FROLICH would address the Academy.

The General Chairman of the Committee on Awards for Scientific Achievement, T. DALE STEWART, called upon WALTER RAMBERG, Chairman of the Engineering Sciences, to read the report of his Committee recommending SAMUEL LEVY, National Bureau of Standards, for the annual award in recognition of his distinguished service in the structural analysis of aircraft. Dr. Stewart then read the report by the Comittee on Physical Sciences, which recommended PHILIP H. ABELSON, Department of Terrestrial Magnetism, in recognition of his distinguished service in the fields of chemistry, nuclear physics, and the physics of living organisms. Dr. Stewart read the report of the Committee on Biological Sciences, which recommended DAVID H. DUNKLE, U. S. National Museum, for recognition of his distinguished service in paleontology, especially by researches on early arthrodiran and teleost fishes.

The Board of Managers unanimously accepted and approved the recommendations of the Committee on Awards for Scientific Achievement.

B. D. VAN EVERA, Chairman of the Committee for the Teaching of Science, indicated that his Committee had decided that no award be made this year. Considerable discussion followed with regard to the difficulties in connection with the age limit as set by the rules of the Board and the advisability of increasing the number of recipients for these awards.

The Chairman of the Committee on the Encouragement of Science Talent, M. A. MASON, read a report summarizing the work of the Committee during the past year. Report will be published in the Proceedings of the Annual Meeting.

The Special Committee on Joint Secretariat, consisting of HARVEY L. CURTIS, chairman, H. S. RAPPLEYE, and NORMAN BEKKEDAHL, submitted the following report:

The following is a report to the Board of Managers of the Washington Academy of Sciences of a special committee appointed in March 1950 to examine the desirability of establishing a central secretarial office to be used jointly by the various scientific societies affiliated with the Academy. This committee [has] sent a circular letter to all the affiliated societies on May 25, 1950, and a follow-up letter on November 20. Replies have been received from all but three of the societies. Six societies stated categorically that they were not interested. Eight societies have sent rather evasive replies. Not one of them indicated anything more than lukewarm interest in the matter. One society suggests that the Academy handle the meeting notices of all societies by means of a monthly publication. Another society indicates that the Engineers' Club has a project similar to that suggested by the Academy and that they are awaiting more complete information from that group before giving a definite reply.

As a result of the information summarized above, this committee does not feel that the Academy would be justified at the present time in establishing a central secretarial office for the scientific societies of Washington.

In discussions concerning the central secretariat the question arose concerning the desirability of having an executive secretary to handle many of the affairs of the Academy now entrusted to the elected secretary and treasurer of the Academy. It may be possible to have office space in the new building of the Cosmos Club and to have a retired member of the Academy serve as executive secretary on a part time basis. This question, however, is considered outside the field of this special committee and no recommendations concerning it are intended. A summary of the activities of the committee is attached hereto.

The Board expressed their gratitude for the work of the committee in completing its assignment.

The following members, having retired from the gainful practice of their professions, were placed on the retired list: ALICE C. EVANS, LLOYD D. FELTON, MAURICE I. SMITH, JOSEPH S. WADE.

The Secretary reported the following deaths: EDWARD A. BIRGE, University of Wisconsin, Madison, Wis., on June 9, 1950 (elected May 15, 1906); CHESTER STOCK, California Institute of Technology, Pasadena, Calif., on December 6, 1950 (elected February 6, 1942); JOHN F. EMBREE, Yale University, New Haven, Conn., on December 22, 1950 (elected June 28, 1943); H. E. EWING, formerly of the U. S. Bureau of Entomology and Plant Quarantine, on January 5, 1951 (elected May 15, 1934).

The Secretary read a report by W. N. FENTON, Chairman of the Committee on the 40-Year Index of the JOURNAL, indicating that the index had now been completed and the cards are marked for the printer.

The Treasurer, HOWARD S. RAPPLEYE, outlined the financial transactions for the year and submitted the report of the Auditing Committee. Details of this report will be printed as part of the Proceedings of the Annual Meeting.

The President expressed his thanks to the Board and to the various committees for their active cooperation during the year.

The meeting was then adjourned at 9:30 P.M. to partake of some refreshments offered by the outgoing President.

F. M. SETZLER, *Secretary*.

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